An Roinn Tailte

(Department of Lands)

FO-ROINN IASCAIGH

(Fisheries Division)

REPORT

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1961

incorporating Statistics of the Capture of Salmon, Sea Trout and Eels, and certain scientific papers relating to fisheries.

DUBLIN:
PUBLISHED BY THE STATIONERY OFFICE.

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NOTE:—Sea fish are divided into two categories, pelagic and demersal. The term "pelagic" (Greek: "pelagos", the sea) is applied to those fish which usually swim at or near the surface of the water. The main varieties of pelagic fish landed are herrings, mackerel and sprats. The term "demersal" (Latin: "Demergere", to plunge down) is applied to those fish which live during adult life at or near the sea bottom. The chief species landed are turbot, brill, soles, plaice, cod, haddock, hake, ling, whiting, conger eel and ray (skate). Shellfish consist of two classes, viz., molluscs, of which the main varieties gathered are periwinkles, mussels, oysters, escallops and cockles, and crustaceans—lobsters, crawfish, Dublin Bay prawns and crabs.

REPORT

OF THE

MINISTER FOR LANDS

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

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PART I

SEA FISHERIES

The progressive increase in the annual value of fish landings in recent years was halted in 1961 when practically all kinds of fishing were adversely affected by prolonged periods of unfavourable weather. The overall figure for the year was £1,357,242, compared with £1,611,605 in the preceding year. Demersal fish accounted for £820,911 as against £818,828; pelagic fish for £258,645 as against £453,152 and shellfish for £277,686 as against £339,625. A commentary on the fishing under these three heads is given in subsequent sections of this report.

In the following table are set out the figures of weight and value of seafish landings (excluding shellfish) since 1952:—

TABLE I.

Year		cwt.	£
1961	...	516,207	1,079,556
1960	...	688,421	1,271,980
1959	...	592,319	1,205,971
1958	...	547,377	1,025,505
1957	...	532,475	907,119
1956	...	377,367	787,160
1955	...	303,519	686,195
1954	...	254,714	635,802
1953	...	222,516	545,105
1952	...	203,000	478,774

Particulars of the varieties of seafish landed in 1961 appear in Appendix No. 1, while the average value per cwt. of the varieties each year from 1954 is given in Appendix No. 2.

The usual arrangements were made for importing some varieties of white fish to reduce shortages when supplies from home landings temporarily fell short of requirements. Some herring imports were also allowed.

The ports at which the value of landings was highest were Howth, Killybegs, Castletownbere, Dunmore East, Galway, Kilmore Quay, Dingle and Dun Laoire.

DEMERSAL FISHERY.—The total catch of demersal species in 1961 decreased by 21,082 cwt. to 212,703 cwt. from 233,785 cwt. in 1960. This drop in landings was due to reduced catches of haddock, cod and whiting which were only partially offset by some improvement in the landings of other varieties. Whiting represented approximately 43% of the total demersal catch and was followed by ray, plaice, cod and haddock in order of quantity of fish landed. Despite the quantitative decrease, the value of the total catch increased slightly to £820,911 from £818,828 in 1960, representing an improvement of approximately 7/- per cwt. in the over-all average price. The average price of each of the varieties which showed quantitative decreases—haddock, cod and whiting—increased over the 1960 figure. The comparative failure of the cod season early in 1961 at Galway and Killybegs is reflected in the year's catch figures. Haddock also was scarce in spring and early summer at Killybegs. The only varieties which showed decreases in unit value were hake, which suffered a drop of approximately 32/- per cwt., and turbot for which the price per cwt. was approximately 2/- less than in 1960.

Demand for all varieties of demersal fish continued to improve with the result that in most cases higher prices were paid even where on occasions there were good quantities on offer. Only in the case of small whiting in the latter half of the year was any sales difficulty experienced. The bulk of this fish is landed on the east coast where it provides the principal fishery for seine netters from roughly July to December. Firms engaged in quick freezing were regular bidders for varieties required for this purpose and the distribution of their products at home showed steady progress. The auction at the port of Killybegs continued during the year and was reasonably successful. Trawling, as against seine netting, continues to return to favour with fishermen, particularly because the same equipment can be used for pelagic and demersal fishing thus reducing the expense entailed in keeping a vessel in gear.

The following table shows quantity, total value and average value per cwt. of demersal fish for each of the past ten years.

TABLE 2.

Year	Cwt.	£	Average value per cwt.
			s. d.
1961 ...	212,703	820,911	77 2
1960 ...	233,785	818,828	70 1
1959 ...	258,178	800,698	62 0
1958 ...	258,978	717,306	55 5
1957 ...	259,722	693,330	53 5
1956 ...	225,488	660,674	58 7
1955 ...	193,916	593,190	61 2
1954 ...	169,926	540,690	63 7
1953 ...	147,757	451,901	61 2
1952 ...	134,841	397,276	58 11

PELAGIC FISHERY.—*Herrings* :—Results of the Irish herring fisheries in 1961 were disappointing. The total catch dropped by approximately 40% to 250,000 cwt. and the unit value fell by 2/2d. per cwt. to 16/9d. per cwt. Unfavourable weather during the period of the fisheries off Dunmore East and Donegal was primarily responsible for the quantitative reduction, while some poor quality fish landed from Donegal Bay and lack of competition from buyers in Waterford area for occasional heavy landings reduced the value of the catch.

The Dunmore fishery in particular suffered a very severe reduction in value of landings in 1961 compared with the previous year, the total value of the catch being approximately one-third of the 1960 figure of over £280,000. The periods of the fishery in 1961 comprised the months of January, October, November and December. The 1960/61 season ended abruptly in mid-January with the onset of severe gales which lasted for about three weeks and which, apart from scattering the shoals, brought fishing to a standstill. Most of the boats had left the area by the time the weather showed signs of improvement and, although the remaining boats tried during February to re-locate the fish, their efforts were not rewarding. In the latter part of 1961, the fishery opened early in October but for most of that month continuous bad weather militated against successful fishing and resulted in a drop of almost 70% in that month's catch as compared with October 1960. Though landings were made more often during November and December, 1961, than they were in the same months of 1960, the fishing was much lighter. The average landings per fishing day in these months in 1960 were 675 crans and 2,070 crans respectively compared with 230 crans and 630 crans in 1961. As a result of the light catches, many boats were not attracted to the herring fishery during these months, particularly as the demersal fishery along the south and east coasts was proving more remunerative. Trawling proved to be the most successful method of herring fishing. The types of trawls used varied from the ordinary bottom groundfish trawl to two-boat Larsen gear.

Up to 50% of the Dunmore landings in January, 1961, were taken by Dutch and German buyers, while in the last three months of the year the freshing and processing trades in Great Britain absorbed the greater share of the catch. During the latter period only very limited supplies were consigned to the continent in the fresh state but a sizeable proportion of the landings was bought for rough packing for early shipment to continental markets ; freezing of whole fish was also undertaken in some quantity for the German market.

The 1960/61 winter herring fishery off the Donegal coast improved in January, 1961, and would have been prosecuted more vigorously but for interruptions caused by unfavourable weather ; for instance, good shoals evident off Burtonport were not followed up to any extent after the middle of the month. Landings in January came mainly from boats fishing into Killybegs and from yawls, using drift nets, operating from St. John's Point and Inver. No further herrings were taken off the Donegal coast until August when the Inver yawls again had some small catches which extended into early September. In October, Killybegs-based trawlers and ringers landed some spent herring from the Inver Bay grounds which they, along with the local drift-net yawls, continued to fish fairly consistently up to the end of the year. Quality remained mainly spent. The total catch from this area at approximately 16,000 cran showed a welcome improvement on the results achieved in 1960 ; trawlers and ring netters had about equal success in their operations.

Disposal of the south Donegal catch was largely through processors, with some off-take for the fresh market at home. The fish meal factory at Killybegs was kept fairly well supplied from these catches, particularly in December when the icy condition of the local roads severely hampered transport except within a limited radius. At Burtonport, Kincasslagh and Bunbeg landings, being of better quality than the south Donegal herrings, found a ready sale for cross-Channel fresh markets and for local marinating and curing ; November and December were the main months during which landings took place and the total catch was in the region of 9,500 crans. The marinates produced at Burtonport were sold in the U.S.A. while the rough-packed and hard-cured products were disposed of in West European markets.

As in 1960, ring netters from Killybegs, Burtonport and Achill fished for herring on the northern side of Clew Bay from mid-September until the end of October. Two vessels from Inishboffin, whose owners had previously studied ring net operation during the fishing off the Isle of Man, also took part in the fishery. Landings mainly at Westport, were not as heavy as in the previous year and by reason of lack of uniformly good quality, general demand was not strong. In mid-November, some herring were landed by Achill boats at Purteen.

Other herring landings of a sporadic nature took place at Howth, Ballycotton, Schull, Gerahies and Dingle, while in May there was a landing of drift net herring in Connemara. Fishing for small herring off Clogherhead was not followed up in 1961 as the prospects of economic disposal of the catch were not sufficiently promising.

The following table shows the quantity, total value and unit value of herrings landed for the past ten years:—

TABLE 3.

Year	Cwt.	£	Average value per cwt.
			s. d.
1961 ...	250,078	209,710	16 9
1960 ...	417,414	394,945	18 11
1959 ...	308,064	364,130	23 8
1958 ...	252,759	268,579	21 3
1957 ...	233,365	173,027	14 10
1956 ...	137,849	101,608	14 9
1955 ...	96,560	73,782	15 3
1954 ...	68,322	72,848	21 4
1953 ...	58,981	70,066	23 9
1952 ...	54,947	60,451	22 0

Pilchards :—In July, 1961, boats from Burtonport, encouraged by the availability of an outlet for fish meal production, engaged in fishing for pilchard off west and north Donegal. Their initial efforts did not result in the location of any shoals but in the following two months four ring net boats succeeded in harvesting some supplies.

Sprat :—As in the case of pilchards, the prospect of a regular demand for fish meal purposes re-awakened interest in fishing sprat. From July to early October six mid-water trawlers from Killybegs engaged in this activity with satisfactory results. Two boats associated with the fish meal factory also operated to supplement the intake of raw material.

Mackerel :—The quantity of mackerel taken in 1961 at 24,007 cwt. was approximately 35% less than in 1960. Fewer boats took part in the fishery off the south-west coast, extending from March to July, probably because shoals were not so plentiful as in the previous year. Drift nets were the main gear used but a couple of boats using trawls had some good hauls. Baltimore, Schull and Union Hall were the principal landing places. The bulk of the catch was exported fresh but there was also a steady demand from the fish cannery at Kinsale. Regular but smaller catches by drift nets were landed throughout the summer and autumn at several points extending from Waterford Harbour to Malinbeg, the chief

centres being Passage East, Ballycotton, Dingle, Caherciveen, Galway, St. John's Point and Malinbeg. Feathering for mackerel provided a secondary occupation for many lobster fishermen along the south and west coasts.

The table hereunder gives statistics of mackerel landings over the past ten years.

TABLE 4.

Year	Cwt.	£	Average value per cwt.
			s. d.
1961 ...	24,007	38,238	31 10
1960 ...	37,125	58,144	31 4
1959 ...	25,645	40,978	31 11
1958 ...	35,490	39,570	22 4
1957 ...	22,913	36,209	31 7
1956 ...	13,850	24,815	35 10
1955 ...	11,563	18,913	32 9
1954 ...	14,766	21,967	29 9
1953 ...	15,374	22,976	29 11
1952 ...	13,018	20,967	32 3

SHELLFISH.—For the second year in succession, the value of shellfish landings declined and by approximately the same amount, £62,000, as in the preceding year. The total value for 1961 was £277,686 in contrast with £339,625 in 1960 and £402,716 in 1959. Lobsters and crawfish catches which, as usual, made the greatest contribution (55%) to the total, were again seriously affected by the occurrence of unfavourable weather, particularly in the months of July, August and September, with the result that the value of the reduced catch of these varieties was £65,000 below the figure for 1960. Mussels, which are mainly gathered at Cromane and Mornington, also showed a decline in landings—from 40,000 cwt. in 1960, to 25,000 cwt. in 1961—but this was largely attributable to the fact that low sea temperatures in 1961 retarded the development of the stock at Mornington to such an extent that meat yields were not found to be sufficiently good for processing needs and fishing was suspended early in the season. Landings of escallops also fell away somewhat because of limitations of fishing weather. Landings of oysters and crabs, which heretofore have contributed only a small fraction of the total value of shellfish, showed improvement and gave promise of more intensive fishing in the future. Catches of Dublin Bay prawns increased substantially compared with 1960 but the average price realised dropped owing to an unduly high proportion of small prawns in the catches sent for marketing.

The demand on continental markets for Irish lobsters, crawfish, and periwinkles continued good and about 80% of the total landings of

these combined varieties, together with initial oyster consignments, found ready markets at satisfactory prices. Development of modern handling techniques for lobsters and crawfish both at ports and inland wholesalers' premises has been effectively maintained by private enterprise with the advice of the Department. Oyster fisheries have also attracted the interest of private enterprise for their development on modern lines: rehabilitation of former natural oyster beds and cultivation of new beds should add considerably to the output of this variety of shellfish in future years.

The following table shows the value of shellfish landings in each of the past 10 years.

TABLE 5.

Year		£
1961	...	277,686
1960	...	339,625
1959	...	402,716
1958	...	291,255
1957	...	239,968
1956	...	233,634
1955	...	196,103
1954	...	154,525
1953	...	142,554
1952	...	124,196

PERSONNEL AND VESSELS.—In 1961 the total number of men engaged in seafishing was 5,712, comprising 1,631 full-time and 4,081 part-time fishermen. The corresponding total for 1960 was 5,868 of which 1,764 were described as full-time and 4,104 as part-time. Some of the decrease in the fully engaged category is accounted for by a stricter interpretation of full-time employment adopted in 1961 the effect of which was to include in the part-time category a number of men formerly classified as full-time. Notwithstanding this transfer to the partially engaged category the downward trend in that category persisted in 1961 but not to the same extent as in previous years.

The number of motor vessels of 15 gross tons and over solely engaged in fishing totalled 227 compared with 240 in 1960. Ten vessels in this category added during 1961 were not sufficient to offset withdrawals from the fleet. Detailed figures are given in Appendix No. 6.

TRAINING OF FISHERMEN.—Both of the training schemes operated in the previous few years were continued. Under that for training fishermen as skippers, applicants are required to be not less than twenty years of age and to have at least three years' sea-fishing experience. Allowances are paid to the trainees. The training lasts for a maximum period of twenty-eight weeks—not more than twelve

weeks being devoted to the practical course on fishing vessels and sixteen weeks to the theoretical course at the Town of Galway Vocational School. The duration of the practical course at sea depends on the fishing experience of the individual trainee.

At interviews held early in 1961 eleven fishermen were adjudged suitable for training. While ultimately six of these did not proceed with the course, the remaining five, together with two others who had previously been selected for training, completed the course and sat for the examination ; six qualified for certificates of competency.

For admission under the scheme for training boys as fishermen, applicants are required to be not less than sixteen years of age. Previous sea-fishing experience is not necessary. Boys are assigned to selected fishing boats for training. Allowances are payable for not more than two years to a boy undergoing training as a deck hand. A boy being trained as an engineman will, if he has made satisfactory progress on a fishing boat, be given further training ashore and his allowance will continue for a further period of up to six months.

Sixteen boys were undergoing training at the beginning of 1961 and twenty-six others were accepted for training during the year. Out of the total of forty-two, thirteen boys withdrew from training, ten progressed to the rank of qualified deck hands on a share basis, and the remaining nineteen were pursuing their training industriously at the close of the year. Further applications were invited in November and arrangements were made to interview applicants early in 1962.

AN BORD IASCAIGH MHARA.—During their financial year ended 31st March, 1961, the Board received from Fisheries Vote a grant of £37,300 in aid of administration and grants totalling £118,009 for general development. In the same period, repayable advances to the Board from the Central Fund amounted to £150,850, mainly for boats and gear.

In the Ninth Annual Report and Accounts of the Board covering the twelve months ended 31st March, 1961, the main features of the Board's activities recorded were as follows:—

Twenty new boats (including four in the 50 foot and five in the 56 foot classes) were issued on hire purchase terms. The total value of boats and gear issued on hire purchase, credit sale or cash sale was £222,967. The number of motor fishing boats the subject of hire purchase transactions at 31st March, 1961, was 131 valued at £968,391 at the time of issue. During the year grants of 15% of the cost of new boats amounted to £16.466 and the subvention reducing the interest payable to 4% cost £1,971.

The quantity of fresh seafish (excluding shellfish and imported white fish) handled by the Board was 121,091 cwt. (valued £497,164) compared with 146,423 cwt. (valued £528,102) in the preceding year. While a slight expansion on the wholesale side was recorded, there was a loss of £3,164 on marketing as against £8,683 in 1959/60.

The Board's three offshore fishing vessels were sold in June, 1960, and realised £33,950. Other fishing boats operated by the Board—five of 56½ feet under the Gaeltacht Scheme and four others for general purposes—two of 56½ feet and two of 45 feet—showed a loss on the year's working.

Production at the Killybegs, Galway and Schull processing factories was far below capacity owing to the inadequacy of supplies of fish at prices which would permit of processing on an economic basis. A loss of £20,632 resulted as compared with £17,327 in the previous year.

The manufacture of ice was continued at Killybegs, Cleggan, Galway, Dingle, Schull, Ballycotton and Dunmore East and commenced at Castletownbere. Ice continued to be sold at the subsidised rate of £4 per ton in order to encourage its use ; for that purpose, a grant of £6,000 was paid from the Exchequer during the year. The demand for ice showed a small improvement but with considerable room for expansion.

In February, 1961, the Board purchased the fish meal factory at Killybegs established by a private company which had gone into liquidation. The premises and plant were subsequently leased to a Danish firm by whom production was resumed on what appears to be a promising basis.

SEA FISHERIES PROTECTION.—In their patrols of the exclusive fishery limits in 1961, vessels of the Naval Service of the Department of Defence arrested three fishing craft of extern registration which had been observed infringing the limits. The skippers were prosecuted and in two cases convictions were secured and fines imposed, the fish and gear found aboard being forfeited also. In the remaining case, a conviction was secured in the District Court but on appeal the verdict was reversed on a technicality. The assistance of the Garda Síochána was, as usual, available in these cases and in the enforcement of fishery measures generally.

MARINE WORKS.—The preparatory work at the five centres selected for development as major fishery harbours is in the hands of the Commissioners of Public Works with whom close consultation was maintained throughout the year. Difficulty was experienced by that Office in recruiting the necessary additional engineering personnel. At Killybegs site investigations and borings in connection with the first stage of the development scheme were completed and detailed design work was commenced. Contracts were placed for site borings at Howth, Passage East, Castletownbere and Galway. Concurrently, arrangements were made for model investigations of the harbours at Howth and Galway and for examination of the conditions at Passage East.

Apart from development of the major fishery harbours, consideration was, as heretofore, given to proposals for improvements at other

fish landing centres. Proposals of this kind, when found on examination to be soundly based, are usually executed by either the Office of Public Works or the Authority concerned with the aid of State grants, the Local Authority contributing the balance of the outlay involved and accepting responsibility for maintenance of the works. During 1961, structural works were in progress or approved for purposes of State grant at Clogherhead (Co. Louth); Duncannon, Cahore and Ballyhack (Co. Wexford); Dingle (Co. Kerry); Enniscrone (Co. Sligo); and Burtonport and Greencastle (Co. Donegal). Additionally, grants had been approved towards the cost of lighting a beacon marking Aileen Reef (south-east of Aranmore Island, Co. Donegal), and of replacing a crane on the pier at Portaleen (Co. Donegal).

SCIENTIFIC INVESTIGATIONS.—The Department's research and exploratory vessel *Cú Feasa*, in her second year of commission, undertook a wide variety of investigations principally concerned with herrings along the south and east coasts, whiting and Dublin Bay prawns (*Nephrops norvegicus*). In addition, surveys of the sea bottom along the west coast in the vicinity of Counties Galway and Mayo were made (see section below on Engineering). This vessel also searched for, located, and drew the attention of fishing boats to herring shoals off Achill in the summer and again in the autumn off Dunmore East.

Investigations into the herring populations along the Wexford/Waterford coasts were conducted throughout the main Dunmore East fishing seasons both at the beginning and end of 1961. An intensive sampling programme for adult herring was undertaken there and during the year samples of herrings from other areas were also obtained. Cruises with a tin-tow net (a device for sampling plankton) were undertaken in the first four months of the year along the south coast from the Tuskar to the Fastnet. The densest concentrations of herring larvae were found in the Daunt Rock area, and lesser, but still important, concentrations were found over a wider area from the Tuskar to the Fastnet. Young herring (less than a year in age) taken by beach seines used along the coasts from Ardmore, Co. Waterford, to Clogherhead, Co. Louth, and from sprat weirs in Waterford Harbour and the estuary of the Blackwater were found to be of the same racial type as those at Dunmore East.

In connection with the herring investigations, Carruthers's vertical log current meters were installed on the Coningbeg and Daunt Rock lightships with the co-operation of the Commissioners of Irish Lights. The instruments, kindly lent by the National Institute of Oceanography, were installed under the supervision of an officer of the British Ministry of Agriculture, Fisheries and Food. By May, 1961, those instruments had provided information regarding the direction and speed of water movements along the south coast. On the basis of this information there would appear to be a coastwise west to east movement of water in the areas of the investigations; young herring,

and probably the young of other species, may be borne in that direction. In this way, larval herrings may be taken from the Dunmore East area into the Irish Sea by the coastwise current.

From the data obtained in the series of investigations, it has been found possible to estimate the potential stock of the Dunmore East herrings and the mortality, both natural and fishing, which is taking place from year to year. The forecast made, as a result of the previous year's study, that the bulk of the catch in 1961 and 1962 would depend upon the four-year-old fish has been confirmed by the 1961 investigations. A report upon the Dunmore East fishery in the 1961/62 season appears as Appendix 24 to this report.

In the case of sprat weir, beach seine and tin-tow net surveys, specimens of clupeoids other than herring (i.e. sprat and pilchards) as well as of other families of fishes, were obtained. Records were made of the abundance of the various species for future reference. The samples from the tin-tow net cruises after the young fish had been removed for preservation were made available to the Zoology Department of University College, Galway, which was studying decapod larvae (i.e. of crabs and similar animals).

Investigations of the whiting stocks of the Irish Sea and off the Cork and Galway coasts were continued during the year. An assistant inspector who is in charge of these investigations has been collaborating with workers from England, Scotland and the Continent in devising a standard method of reading the otoliths (earstones) of whiting.

With the assistance of the *Cú Feasa*, the stocks of Dublin Bay prawns (*Nephrops norvegicus*) in the Irish Sea were studied intensively during the year and it was also found possible to carry out surveys as to the abundance etc. of this species along certain parts of the south and west coasts. A report upon the results of the work on Dublin Bay prawns carried out in recent years appears as Appendix 31 to this report.

No further tagging or marking of lobsters was carried on in 1961, but of the 276 lobsters tagged and released at Dalkey, Co. Dublin, in June, 1960, 69 had been returned by the end of 1960 with a further 18 recaptured as moulted lobsters in 1961. The results of all the tagging and marking experiments at Dalkey since 1957 has enabled a reliable estimate of the rate of growth of lobsters there to be made. During 1961 the data collected from the series of lobster investigations carried out since 1957 were examined for preparation of reports. A report on one aspect of the investigations appears as Appendix 29.

A large-scale transplantation scheme for re-seeding depleted mussel beds in Castlemaine Harbour was undertaken in March and April. Approximately 1,000 tons of seed mussels were transplanted to a new and completely submerged bed. Examination of the transplants at

regular intervals showed that by the end of 1961 there had been length increases ranging from 5% to 50%, with a considerable improvement in the quality of the meat.

A study of one of the oyster fisheries off the west coast was undertaken in 1961. Artificial spat collectors were erected but no spat were obtained, probably because of the exceptionally low sea temperatures which made it unlikely that there was any substantial reproduction of oysters during the year. Sampling of oysters in Galway Bay and Tralee Bay indicates, however, that the 1959 brood was very successful. The Inspector and Scientific Advisor completed a paper on the history of the Irish oyster fishery which has been accepted by the Royal Irish Academy for publication.

Surface temperatures of sea water were taken twice daily during the year at the Coningbeg Lightship and, in connection with the herring investigations, a limited amount of hydrographical work was carried out along the east and south coasts.

During the year the Department's scientific staff identified many specimens of fishes for the Irish Specimen Fish Committee and the public generally. Several fishes rare or scarce in Irish waters were reported. A single specimen of the anchovy (*Engraulis encrasicholus*) was identified from the catch of small fishes made by a beach seine in the estuary of the Castletown river near Dundalk on the 21st July, 1961. This is the third specimen to be recorded from Irish waters despite its great abundance along the French, Spanish and Portuguese coasts. A single specimen of the Mediterranean ling (*Molva elongata*) was obtained from the Dingle area on the 11th June. This was the first record of this species from Irish waters. As the fish was only 13" long and weighed only 5 ozs. its captor is to be congratulated on having identified it as a rare fish. Beach seining in the estuary of the Dundalk river was also responsible for the capture of a black bream or old wife (*Spondyliosoma cantharus*) on the 14th August. This species had only been recorded five times, three of the records being from the 19th century. A pelamid or short-finned tunny (*Sarda sarda*) was taken at Ballycotton on the 28th May in a drift-net, this being the fifth member of this species to be recorded here. A rare flat fish, Eckstrom's topknot (*Phrynorhombus regius*), was recorded on the 18th February off Passage East in Waterford Harbour. This is only the fourth specimen to be recorded from Irish waters. A file or trigger fish (*Balistes capriscus*) was taken off Arklow on the 24th August, this being the eighth specimen to be recorded here. In addition to these rare fishes, scarce fishes were also recorded in 1961 as follows:—

i. Boar fish (*Capros aper*)—2 specimens—March and April from Dingle.

ii. Stone basse (*Polyprion americanus*)—2 specimens—4th September from Dingle Bay and 17th October off the Old Head of Kinsale.

iii. Ray's bream (*Brama raii*)—9 specimens taken by the *Cú Feasa.* from the North Sound in Galway Bay on 24th August and 1 specimen on 2nd September from Dingle.

iv. Red band or red snake fish (*Cepola rubescens*)—3 specimens from Dingle Bay on 16th January and 2nd and 20th September.

The Old Head of Kinsale stone basse was taken on rod and line.

Further specimens of the great silver smelt (*Argentina silus*), the greater forkbeard (*Urophycis blennoides*), the piper (*Trigla lyra*), and the scald fish (*Arnoglossus imperialis*), all of which were believed until recently to be rare or scarce, were recorded during the year mainly from the Dingle area.

A report on rare and scarce fish in Irish waters in 1961, prepared by the Inspector and Scientific Adviser, and accounts prepared by an Inspector and an Assistant Inspector, of the Ray's bream from Galway Bay and the greater forkbeards from the south and west coasts were accepted for publication in the *Irish Naturalists' Journal.*

INTERNATIONAL AND OTHER CONFERENCES.—

(1) International Council for the Exploration of the Sea.—At the annual conference of this Council, which took place in Copenhagen from 2nd to 11th October, 1961, the Inspector and Scientific Adviser and one of the Assistant Inspectors attended. These delegates presented papers prepared by various officers of the Department as contributions towards the work of the Salmon and Trout, Herring, Shellfish, Gadoid Fish and Hydrographical Committees. The Assistant Inspector took part in a symposium on herring held prior to the main meeting and also in a symposium on "Zooplankton" held from 8th to 10th October, 1961. The Inspector and Scientific Adviser was again re-elected Chairman of the Consultative Committee which directs the scientific work of the Council through its various committees.

Meetings—two in Aberdeen and one in Ijmuiden—of groups of experts concerned with the Council's work on the reading of otoliths of whiting were organised during the year and were attended by an Assistant Inspector.

(2) Permanent Commission established under the International Fisheries Convention of 1946.—The Assistant Secretary in charge of fisheries, accompanied by the Inspector and Scientific Adviser, attended the ninth meeting of the Commission in Copenhagen in May, 1961. At this meeting, arrangements were made for setting up a Working Group under the Chairmanship of Professor W. Cieglewicz (Poland), to consider the steps necessary to regulate those fisheries which, under the Convention, can be pursued by small mesh nets so as to limit damage to species protected by the Convention. The first meeting of this Working Group was held in London

in December, 1961, and was attended by both of this country's delegates to the meeting of the Commission. The Inspector and Scientific Adviser, in his capacity as Chairman of the Consultative Committee of the International Council for the Exploration of the Sea, also acted as Chairman of the Liaison Committee established to provide a vehicle for the exchange of information between the Commission and the Council.

(3) CHALLENGER SOCIETY.—This Society, established to foster an interest in oceanography, holds regular joint meetings with marine and other laboratories. On 24th and 25th May, 1961, the Society, at the invitation of the Minister for Lands, held a meeting in Dublin at the premises of the Royal Dublin Society, Ballsbridge. Among the papers contributed to the meeting were those on the following subjects prepared by officers of the Department:—

(*a*) "Ireland's rare fishes";

(*b*) "The Dunmore East herring fishery";

(*c*) "Irish lobster investigations";

(*d*) "Irish whiting";

(*e*) "*Nephrops norvegicus* in the Irish Sea";

(*f*) "Movements of salmon around Ireland";

(g) "Preliminary observations on the effects of arterial drainage works on fish stocks", and

(*h*) "Predation by pike".

Departmental officers also co-operated in demonstrations relating to freshwater and marine biology, including fishes, on the afternoon of the second day. The Challenger Society held a further meeting at the Plymouth laboratory of the Marine Biological Association of the United Kingdom from 27th to 29th September, inclusive, when one of the Assistant Inspectors participated in the discussions.

(4) ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT.—The Department participated in the work of the Fisheries Committee established under this Organisation. The primary objective of this Committee is the confrontation of fishery policies of member States but other activities engaged in include surveys of the market situation for the main fishery products with a view to improving marketing and distribution and the study of measures to be adopted to assist the fishing industry in developing countries. The Department was represented at a session of the Committee held in Paris in October, 1961, and also at a meeting in Paris in December, 1961, of experts on sanitary regulations affecting international trade in fish and fish products.

ENGINEERING.—A low-tension electrical depth indicator was developed and tested with satisfactory results by an electronic engineering firm with the collaboration of the Department's engineering

staff. The instrument is for measuring the depth of submersion of fishing gear for exploratory, research and other purposes.

The engineering staff collaborated with the biological staff in investigations carried out by the exploratory fishing vessel Cú *Feasa* in relation to herring, whiting and Dublin Bay prawns. A close sounding survey was carried out by the vessel of an area of the sea off the west coast extending from Cape Cregga in Co. Clare to Achill Head and seawards as far as the 70 fathom line. A chart showing the results of this survey was in preparation at the end of the year.

TECHNICAL ASSISTANCE.—Under the Department's technical assistance programme, two officers attended a course of study of fish handling and processing at Torry Research Station, Aberdeen. A Departmental biologist was seconded to the Salmon Research Trust of Ireland, Incorporated, for the purpose of conducting an investigation into the effects of the discharge from bog workings on fish food, fish life and spawning potential in certain Irish river systems.

LEGISLATION.—Particulars of statutory instruments relating to sea fisheries, made during the year, are given in Appendix No. 21.

PART II

INLAND FISHERIES

The total catch of salmon by all methods in 1961 was very slightly less than in the preceding year, being 1,345,653 lb. valued at £410,381, compared with 1,364,292 lb. valued at £410,779 for 1960. The catch of sea-trout at 90,102 lb. valued at £14,648 was, however, very much in excess of that for the previous year, which amounted to 61,948 lb. valued at £10,712. Appendix 10 gives the quantities of salmon and sea-trout taken in the years 1959, 1960 and 1961. The figures do not include the catches made in the Foyle area (part of which formerly comprised the Moville Fishery District) but these catches are shown separately in the section of the report dealing with the activities of the Foyle Fisheries Commission (page 26).

During 1961 conditions for commercial fishing and angling varied very much throughout the country and even in those areas in which conditions were favourable the catches were comparatively low. This suggests that the runs of fish were in fact poorer than average. The season was also characterised by much lower temperatures than usual which may have influenced runs of fish on occasions. All age groups of salmon appear to have been in somewhat short supply. The grilse, as has been usual in recent years, again ran very late, the peak catches being made in late July instead of at the beginning of the month or even at the end of June as was the case a decade ago. Towards the end of the summer high water conditions adversely affected commercial fishing in many areas. Where this occurred there was a relatively high escapement resulting in a reasonably good spawning season in many rivers.

Particulars of the catch in each Fishery District for the years 1959 to 1961 inclusive are given in Appendix 11. The catch in 1961 was distributed, as to the various methods of capture, as follows:—

Draft nets	55.1%
Drift nets	16.2%
Rod and line	14.4%
Stake nets and other methods ...	14.3%

The proportion of salmon and grilse taken on rod and line showed a decrease on that of the previous year. The total catch by this method was 25,349 and the weight was 193,376 lb. valued at £65,023; this was also less than in 1960. The average weight of salmon and grilse landed on rod and line was 7.6 lb., compared with 8.4 lb. for 1960 and 8.2 lb. for 1959. The reduction in average weight can be attributed to the smaller proportion of spring fish taken in 1961 compared with the two previous years.

A total of 8,578 rod licences were issued in 1961; this showed a reduction of 164 on the previous year but was well in excess of the

number in 1959. The average catch by rod and line throughout the country was 2.95 fish weighing 22.5 lb. valued at £7 11s. 7d. compared with 3.1 fish weighing 26.4 lb. valued at £8 14s. 11d. for the previous year. The highest average weight for rod caught salmon (12.5 lb.) was in the Drogheda District. This is due to the fact that the rod fishing in the River Boyne takes place mainly in the first half of the season when large spring fish of relatively high average weight are fairly numerous. In the Galway, Connemara, Ballinakill, Bangor and Ballina Districts, in which the bulk of the catches are grilse, the average weights were low (from 5.6 to 6.2 lb.).

The catch of sea trout by all methods showed a marked increase on that of the previous year due partly to good runs of fish and partly to favourable conditions for fishing, particularly by rod and line in many rivers. The rod catch at 64,127 lb. was in fact more than the total catch for the previous season. The sea trout catch was distributed as follows:—

Rod and line	71.2%
Draft nets	25.5%
Other commercial methods ...	3.3%

The form in which the catch statistics are furnished does not lend itself to expressing the average catch per rod by persons fishing solely for sea trout. In the Connemara District, however, which is one of the leading sea trout districts, returns showed that an average of some 36 sea trout weighing 33 lb. were landed per rod licence issued.

The long established drift net fishing by small boats off the Donegal and Mayo coasts was hampered by extremely stormy weather on occasions but despite this the catch was maintained at approximately the level of the previous year. Due to the late appearance of the grilse the season tended to run later than usual.

The smolt runs in most rivers were reported to be satisfactory and, in general, fish mortality, particularly that due to furunculosis, appeared to be low.

In accordance with the usual practice, officers of the Department made visits to the principal fish markets in Great Britain to investigate the grading of Irish salmon. The information collected is being used to secure improvement in packing, icing and transport of this valuable fish to market.

In 1961 the Corporation of Dublin Wholesale Fish Market handled 42,316 salmon and grilse weighing 303,883 lb. compared with 45,424 fish weighing 340,841 lb. for 1960 and 50,936 fish weighing 401,252 lb. for 1959.

BOARDS OF CONSERVATORS.—Details of receipts and expenditure of Boards of Conservators in 1961 are given in Appendix No. 17 to this Report.

EMPLOYMENT IN THE INDUSTRY.—Exclusive of persons employed on the marketing and transport of fish, a total of approximately 4,800 persons found either whole-time or part-time employment in inland fisheries during the year. The figure includes approximately 2,900 persons engaged in netting for salmon under common law right and 850 employed by Boards of Conservators on protection of fisheries over the open and closed seasons, the remainder being employed by proprietors of commercial salmon fisheries, by fishery owners or by angling associations.

INSTRUMENTS OF CAPTURE.—The total number of fishing licences of all kinds issued during the year was 9,980 representing a decrease of 79 on the figure for 1960. The totals in recent years were—1960, 10,059; 1959, 9,165; 1958, 11,053; 1957, 10,531; 1956, 10,135; 1955, 9,027. The numbers of the various classes of licences issued in each fishery district during the year and the rates of licence duty are given in Appendices Nos. 18 and 19 respectively.

OFFENCES AGAINST THE FISHERY LAWS.—The number of prosecutions during 1961 was 233 as compared with 199 in 1960. The Garda Síochána continued to co-operate with Boards of Conservators in the protection of inland fisheries during the year.

SALMON EXPORTS.—The quantity of salmon exported in fresh chilled or frozen form in 1961 was 9,289 cwt. valued at £402,797 as compared with 10,920 cwt. valued at £474,322 in 1960. These figures include landings of salmon in Co. Donegal from waters in the area administered by the Foyle Fisheries Commission. The average export price per cwt. was £43 7s. 3d. as compared with £43, 8s. 9d. in 1960. Of the total quantity exported 7,649 cwt. went to Great Britain and 940 cwt. to France. In addition 143 cwt. of smoked salmon valued at £15,212 were exported in 1961—mainly to Great Britain, as compared with 120 cwt. valued at £13,330 in 1960.

The number of salmon exporters licensed under the Agricultural and Fishery Products (Regulation of Export) Act, 1947 (Export of Salmon) Order, 1954 (S.I. No. 275 of 1954), was 79.

DEVELOPMENT OF EEL FISHING.—The setting up of new eel weirs and the revival of old eel fisheries continued, the total number of temporary authorisations issued being 43. One Order was made authorising the operation of an existing eel weir without a free gap, the weir in question being the last structure on the river before it enters the sea.

On the whole, 1961 was not a good eel fishing year and there was a decrease in the quantities of eels exported. In 1960, 3,212 cwt. of eels, valued at £40,562, were exported but these figures decreased to 1,869 cwt. of eels valued at £25,678 in 1961.

Investigations were made into the eel stocks of several rivers and in the use of improved types of nets for the catching of eels. A

series of tests were made with tagged eels to determine the efficiency of certain eel weirs on the River Blackwater, Co. Meath, and the weir on the Burrishoole River, Co. Mayo. The possibility of developing eel fishing in estuaries and lakes by an arrangement of small fyke nets was examined.

Information was prepared on the storage and smoking of eels and advice was given to eel fishery operators on how to increase the catching power of their engines. Plans were formulated to have smoking demonstrations carried out early in 1962.

FISH CULTURE.—The two demonstration fish farm units set up in 1960 at Aherlow, Co. Tipperary, and Blackwater, Enniscorthy, Co. Wexford, made good progress during the year and illustrated the feasibility of combining small-scale fish pond culture with ordinary farming. The farmer at Aherlow decided during 1961 to expand the scope of his activities and five additional ponds were constructed under the guidance of fisheries engineers. Provision was also made for using the waste channel as an additional rearing pond. A full report on these two units is given in Appendix No. 28.

Two further demonstration units were constructed in 1961, one at Raford, Kiltullagh, Athenry, Co. Galway, and the second at Ballymote, Co. Sligo. The ponds were each stocked in October with 4,000 shasta fingerlings of rainbow trout and 8,000 irideus fry. Surveys were also made for the setting up of a double unit at Mullingar.

Inspections were carried out at a number of sites on behalf of persons interested in setting up private units and one such unit at Teelin, Co. Donegal, was under construction before the end of the year. Assistance was also given to a company, Rainbow Limited, composed of Danish and Irish interests, in formulating plans for a commercial scale fish farm in the vicinity of Waterville, Co. Kerry, to consist of rearing ponds on the Cummeragh River and a hatchery on the Finglas River, construction of the latter being in progress at the end of the year.

Certain trials were carried out into the use of different types of food pellets for rainbow trout. Difficulty was encountered in making some types of pellets palatable to the fish and in general the conclusion reached was that, if adequate quantities of fish offal could be procured, it would be best to dispense as far as possible with the use of pellets.

Site inspections were carried out in connection with proposals by private interests for rearing rainbow trout in sea water and arrangements were made for officers of the Department to inspect such methods of rearing fish as practised in Norway.

ARTIFICIAL PROPAGATION.—Details of salmon, sea trout and brown trout ova produced at the various hatcheries are given in Appendix No. 22.

The output of salmon ova in the 1961 spawning season amounted to 5,250,000, a decrease of just over 2,000,000 on that of the previous year. The sharp fall in output was due to unfavourable weather conditions which resulted in poor catches generally for hatchery operations. 1,237,000 salmon ova and 36,000 sea trout ova were distributed from the Department's hatchery at Glenties, Co. Donegal, and the State-assisted hatchery at Lismore, Co. Waterford. The Inland Fisheries Trust, Incorporated, released 1,000,000 brown trout fry, summerlings and fingerlings, in waters where the Trust was working. In addition 100,000 rainbow trout, fingerlings and yearlings, 81,000 salmon fry and 50,000 sea trout fry were stocked in selected waters. The Trust also sold 250,000 brown trout, mainly summerlings and fingerlings, to forty-eight angling associations for release in waters under their control.

REGULATION OF ERNE SALMON FISHERY.—As in 1960 normal fishing for salmon by commercial methods was suspended until an escapement of upwards of 3,000 fish past Cathaleen's Fall dam should be recorded on the counting apparatus maintained there by the Electricity Supply Board. This arrangement is designed to permit limited exploitation as far as consistent with the need for restoring adequate spawning stocks of fish.

The run of fish in the river in 1961 failed to come up to the level of 1960 and the requisite number of fish did not pass through the counter until 6*th August*—thirteen days before the close of the commercial fishing season. The special local licence duty for draft nets was fixed at the nominal sum of £5 but only one licence was taken out.

Suspension of fishing will continue in 1962 when the position will fall to be reviewed.

SCIENTIFIC INVESTIGATIONS.—Since 1948 Ireland has participated in the international salmon tagging programme sponsored by the International Council for the Exploration of the Sea. In continuation of the work of previous years further taggings were carried out in 1961 at Ardmore, Co. Waterford, of salmon and grilse taken by drift nets. In all, 92 fish were tagged in April, May and June and 22 (23.8%) recaptures were made. Two recaptures were made in the River Slaney, two in Waterford Harbour, fourteen in the Blackwater, three in the Bandon river and one in the River Laune. The greatest distance recorded was one of 113 miles (i.e. to the River Laune). A progress report upon these experiments for the year 1961 was presented to the Salmon and Trout Committee of the International Council for the Exploration of the Sea. At the close of the period under review a full report upon the taggings at this station was in course of preparation.

During 1961, 1,949 kelts of salmon and sea trout were tagged in the Rivers Ballisodare, Blackwater, Erne, Lee, Nore, Owenea and

Shannon and 58 recaptures were recorded. The number of recaptures was low mainly because fishing in the River Erne, in which a large number of kelts were tagged, was curtailed during 1961 in an endeavour to build up stocks. The Inspector and Scientific Adviser prepared a report during the year on the work done on tagging of salmon kelts since 1900 which will eventually form part of a more extended survey of scientific work done in Ireland on the salmon in the past sixty years.

Material, consisting of sets of salmon and grilse scales with relevant data, was collected during the year from the Rivers Corrib, Moy and Shannon. A report upon the salmon material from the River Owenea collected previously was prepared during the year and this appears as Appendix No. 26 to this Annual Report. A similar report on the recent material collected from the River Corrib was also completed during the year and this is printed as Appendix No. 27 to this Report. Further material from the Bundorragh river was also collected and a report was completed during the year which appears as Appendix No. 25.

Material relating to the sea trout of the Bundorragh river system collected in 1960, was mounted up and worked out during 1961 and a report upon it was prepared. This report and a similar report upon material relating to sea trout previously collected from the Argideen river will be published as appendices to a review of the work done to date on Irish sea trout prepared by the Inspector and Scientific Adviser and accepted for publication in the *Scientific proceedings of the R.D.S.*

Collections of sets of scales of brown trout from Loughs Mask and Con and to a lesser extent from other locations were made during the year with a view to determining the age and growth of the fish in question. Studies of the age, growth, food and predatory habits of pike from lakes in the west of Ireland, including Loughs Conn, Corrib and Mask, were continued during 1961 and a report on the age and growth determinations by means of scales and otoliths was in preparation at the close of the year. A study of the effect of pike on the trout population in a small lake in Co. Mayo was initiated during the year. The size of the original trout population was determined by means of standard seine hauls and the age and growth of the trout were determined in the usual way by measurement of the scales. Subsequently a small number of male pike were placed in the lake and it is proposed to follow their progress in future.

The investigations initiated in May, 1960, as to the effects of the proposed drainage scheme on the River Moy on fish life were continued during the year. A number of survey stations were established on the River Moy and its tributary, the Bunree. At these stations investigations of the chemical, biological and physical conditions were undertaken during the year. In November, 1961, a graduate biologist was appointed to a studentship to carry out detailed investigations at these stations.

Further investigations into the passage of salmon smolts past the dams on the River Lee were undertaken during the year, and material relating to pike in the reservoirs was collected with a view to determining the predatory effect of this species on the salmonid fishes, i.e. salmon and trout.

Towards the end of the year a survey of the spawning beds of the River Erne was initiated to provide factual information for the programme of rehabilitation of the salmon stocks of that river system. As in the previous year fishing on the River Erne was curtailed and one of the Assistant Inspectors of Fisheries spent a portion of the normal fishing season investigating the runs of fish into the river. In connection with the investigations of the River Erne, Lough Knader near Ballyshannon was stocked in 1959 with unfed salmon fry, after the various coarse fish in the lake had been killed by Rotenone. In the spring of 1961 a number of salmon smolts dropping downstream toward the sea were captured in a trap, tagged and subsequently released. The survival from the ova to the smolt stage in this case was 2.3%.

At the beginning of the year kelts found dead in various rivers were examined bacteriologically to ascertain the incidence of furunculosis. Unlike in Scotland where the incidence of furunculosis in dead kelts has been reported to be high, in the Irish samples the incidence was very low (less than 1%). This work was being continued at the close of 1961.

A report on the investigation into the growth and feeding habits of trout and perch in Poulaphouca reservoir, started by one of the Assistant Inspectors of Fisheries when he held a studentship, was completed during the year. Copies of this report, together with a summary, were distributed with appropriate recommendations to the various people concerned including the Dublin Trout Anglers' Association, which had contributed to the cost of the investigation, and to the Electricity Supply Board. A shortened version of part of the report on the feeding habits of trout and perch in this reservoir was prepared and submitted to the Royal Irish Academy for publication.

Members of the public interested in scientific information about their catches continued to send to the Department sets of scales and relevant data for examination. Fish and scales submitted to the Irish Specimen Fish Committee for expert identification were also examined throughout the year by the Department's scientific staff.

ENGINEERING.—*Hydro-electric development*:—No new schemes were initiated and work as in the previous year was concentrated on the study of the effects of existing hydro-electric installations on fish life. Study on the passage of smolts through turbines was continued. Results of the tests made during the year compared closely with those of 1959 in the Erne and 1960 in the Lee and Shannon. A difficulty associated with the experiments is that where live smolts

are used the conditions of capture of the smolts may effect the results. A further problem arises from the fact that smolts sometimes delay for long periods immediately above dams before making the descent. The possibility of preventing this is under examination.

The air bubble equipment referred to in the report for 1960 was installed by the Electricity Supply Board in the Iniscarra reservoir in the River Lee. Weather conditions which in previous years had been so important a factor in causing stratification of the impounded water and deoxygenation of the lower layers did not obtain in 1961. Consequently no tests of the apparatus were carried out.

There was an improved run of fish into the River Clady in 1961 where the new programme of river discharges to encourage fish movement was tried out.

Difficulties about securing facilities for erection of a trap were among the causes which prevented advance in the arrangements to utilise the fish stocks of the Abbey River for re-stocking the River Erne.

Arterial Drainage:—Rivers in which drainage works have been completed and are now being maintained by the Office of Public Works were kept under observation during the year.

In fishery interests some minor modifications to the barrage on the River Corrib at Galway were found to be desirable and were put in hands by the Office of Public Works. Special attention was paid to the salmon and eel weirs at Galway.

Work in progress on the Rivers Corrib, Moy, Inny and Maine were kept under observation. A Denil type fish pass to the Department's design was built at Tuam, Co. Galway, and a design was prepared for a groyne pass to be built at Burrisheen bridge, Co. Galway.

Details of drainage schemes, in the course of survey, design or preparation for execution, for eleven further rivers were received from the Office of Public Works and have been under preliminary examination and discussion with the engineers of that Office. In particular angling pools and spawning beds have been surveyed with a view to recommending designs and work programmes which will minimise possible damage to fisheries.

Salmon River Improvements:—Many requests were received from Anglers' Associations, Boards of Conservators and private fishery owners for advice on improvements under this scheme. Most of the sites concerned were inspected and appropriate advice was given. A number of Boards of Conservators availed of the scheme of grants for river improvements; work included the building of croys to establish salmon pools and the rehabilitation of spawning beds. The Boards have reported that a large number of salmon have been observed to spawn in the beds so treated.

Preliminary designs were prepared for fish passes in five obstructions and the investigation of a further four was put in hands. In the case of three others final arrangements were made for some easing of the obstructions when water conditions suit. Eight obstructions are under observation as a preliminary to detailed survey and the preparation of designs for passes.

The work designed for the rock fall at Ashgrove Mill, Kenmare, Co. Kerry, was carried out with satisfactory results. The existing fish pass at Fermoy weir was repaired by the mill owner in accordance with the Department's requirements.

A contract was placed for the construction of the fish pass in the River Inagh, at Ennistymon, Co. Clare; work was not due to commence until the spring of 1962.

Salmon Hatcheries:—The Galway Board of Conservators undertook the construction of the hatchery and fish trapping arrangements at Cong, Co. Mayo. The Department made available engineering experience and general technical advice necessary for the prosecution of the work.

Fish Counting:—Electronic fish counters of Irish design and manufacture were installed at the fish pass in the sluice barrage on the River Corrib at Galway and at the Campsie Weir on the River Faughan, the latter being for the Foyle Fisheries Commission. A site for a counter was selected on the Bunree River near Ballina. A proposal for the erection of a counter on a commercial salmon weir was examined but deemed to be impracticable. A smolt trap was designed and built for installation at the sluice barrage in Galway. A mechanical fish counter was installed by private interests at the pool fish pass at the lower weir in Sligo.

General:—Five proposals for new industrial undertakings involving operations likely to affect fish life by abstraction of water, by pollution or by other action, were examined and the promoters advised appropriately. In addition ten reports of pollution were investigated and remedial measures recommended where deemed necessary.

Other engineering work is referred to in the sections on development of eel fishing and on fish culture.

Foyle Fisheries Commission:—A survey of the Foyle system was carried out with a view to examining the possibilities of erecting counting devices to measure the escapement of salmon and the descent of smolts. A satisfactory electronic fish counter was installed at the fish pass at Faughan pumping station. Difficulties observed in the operation of this fish pass were studied and Consulting Engineers were advised on the alterations needed. The results of the alterations have been very encouraging.

FOYLE FISHERIES COMMISSION.—Angling conditions in the Foyle Area were reported to be generally good for most of the

season but the over-all rod catch of salmon and sea trout was the lowest for some years, due apparently to poor escapement of fish upstream. The causes and effects of the poor escapement were engaging the attention of the Commission and its advisers at the end of the period under review. The catch of salmon and sea trout by nets was also below the average in recent years. Particulars of catches by nets and rods, as published in the Commission's report, were as follows:—

	Salmon		Sea Trout		Total	
	Number	lb.	Number	lb.	Number	lb.
Nets ..	60,703	417,446	2,586	3,199	63,289	420,645
Rods ..	998	7,967	2,596	2,727	3,594	16,694
TOTAL ..	61,701	425,413	5,182	5,926	66,883	437,339

The following regulations were made during the year:—

1. Foyle Area (Restriction of Netting) Regulations, 1961;
2. Foyle Area (Rivers Finn and Foyle) (Close Season for Angling) Regulations, 1961.

Investigation into the fauna of the River Finn basin was concluded but further investigations will be necessary into the density of fish life, mortality of alevins and the extent of predation before any final conclusions can be drawn. A survey of the feeding potential of selected tributaries of the River Mourne system was commenced and an extensive programme of research to cover the next five years was drawn up for the fisheries of the Foyle area in general. Tagging of salmon and grilse was continued. 410,000 salmon fry were released in different rivers. 103 prosecutions were taken, 84 of them resulting in convictions.

A detailed review of the Commission's activities is included in that body's annual report for the year ended 30th September, 1961.

INLAND FISHERIES TRUST, INCORPORATED.—The work of developing our fishing resources in the interests of angling tourism continued. Predator removal was carried on satisfactorily, a notable feature being the use of brushwood bundles for the collection of perch spawn. Special operations with electrical fishing units were carried out successfully on several rivers. Selected waters were again stocked with fry and fingerlings of salmon, sea trout, brown trout and rainbow trout. The planting of brood stocks of adult tench, bream and rudd in areas suitable for coarse fishing development was continued. Long-term investigations are being made into the food and growth rate of trout in various waters with a view to classifying them into suitable categories from the point of view of both management and angling. Surveys of the coarse fishing potentialities of different areas were undertaken and advice was given to local groups.

Five sea-angling surveys were carried out, all of which proved very promising. Two of these were at Dungarvan one into the potentialities of the inshore waters and the other into the offshore waters. Shore angling was surveyed in a preliminary way in three areas in which the development of sea angling resources is as yet comparatively untried. The first covered the southern side of the Shannon Estuary from Foynes to Ballybunion; the northern side of the estuary from Kildysart to Loop Head was covered on the second, and the third survey was carried out along the Atlantic coast of Clare from Kilkee to Lahinch. Advice was given in the preparation of brochures and general publicity and in the running of competitions and festivals. The formation of clubs in areas where there is a good angling potential was continued.

Production of rainbow trout for table use was continued at the fish farm at Fanure, Roscrea, in addition to the production of fry, fingerlings and adult fish for re-stocking. In view of the increased home production of rainbow trout for table use it was decided to concentrate in the future on the production of fish for stocking and fry for sale to small-scale rainbow trout producers.

A conference of representatives of angling associations and other local groups interested in angling tourism was conducted by the Trust in collaboration with Bord Fáilte Éireann in the Mansion House, Dublin, on December 8th and 9th. The proceedings included a symposium on management of fishing waters and on the problems met in the development and promotion of tourist angling.

The Grant-in-Aid to the Trust provided out of the Fisheries Vote was £33,500 while Bord Fáilte Éireann contributed £24,170.

SALMON RESEARCH TRUST OF IRELAND, INCORPORATED. —The report of the Salmon Research Trust for the year ended 31st December, 1961, contains full details of the Trust's activities for the year, together with appendices giving the results of work done on some aspects of the life of salmon and sea trout in the Burrishoole River and associated subjects. Two further rearing ponds were erected at the Furnace station during 1961 and other improvement works were carried out. Incoming and outgoing salmon and sea trout were controlled by means of a counting fence. Tagging of salmon and sea trout kelts, eels and some young salmon was also carried on during the year. As usual salmon of known ancestry were reared and in the early part of the year some of the young salmon were fed with raw minced beef thyroid in an endeavour to obtain earlier smoltification. Further progress was made in the study of the efficiency of different types of smolt tags.

A university graduate was engaged by the Trust to make a survey of the food of the brown trout in the Burrishoole River system.

In accordance with an arrangement made earlier a biologist was seconded by the Department to the Trust to conduct research into the effects of peat silt on salmon stocks and salmon rivers generally.

This aspect of the Trust's work, which only commenced at the close of the period under review, is being financed by Messrs. Arthur Guinness, Son & Co. Ltd., Bord na Móna and the Department jointly.

LEGISLATION.—A Bill to amend the Foyle Fisheries Act, 1952, was introduced in Dáil Éireann during the year and became law on 20 December, 1961, as the Foyle Fisheries (Amendment) Act, 1961 (No. 44 of 1961). The more important amendments included extension of the powers of the Foyle Fisheries Commission and provision of more severe penalties for fishery offences involving use of poison or explosives. Parallel legislation was introduced also in the Parliament in Belfast.

Particulars of statutory instruments, relating to inland fisheries, made during the year are given in Appendix No. 21.

BRIAN LENIHAN,

Parliamentary Secretary to the Minister for Lands.

17 October, 1962.

APPENDICES TO THE REPORT ON SEA AND INLAND FISHERIES FOR THE YEAR 1961.

Appendices 10 to 16 are compiled from returns furnished by licence holders in pursuance of the Statistics (Salmon, Sea Trout and Eels) (No. 2) Order, 1945.

APPENDIX No. 1

Quantity and value of Sea Fish (excluding salmon) returned as landed in 1961

Kinds of Fish	Quantity	Value
	cwt.	£
Soles	3,112	47,684
Brill	1,851	18,720
Turbot	2,077	20,766
Plaice	21,298	175,826
Dabs	4,701	12,983
Megrims	2,548	8,696
Other Flat Fish	3,502	10,870
Ray/Skate	26,966	90,916
Cod	20,850	126,638
Haddock	12,051	63,703
Hake	3,035	18,322
Whiting	93,086	185,801
Pollack	8,654	23,826
Other Round Fish	8,972	16,160
TOTAL DEMERSAL	212,703	820,911
Herrings	250,078	209,710
Pilchards	2,259	865
Mackerel	24,007	38,238
Sprats	27,160	9,832
TOTAL PELAGIC	303,504	258,645
TOTAL WET FISH	516,207	1,079,556
	Nos.	
Lobsters	318,985	101,615
Crawfish	134,388	58,372
Crabs	80,370	1,490
Escallops	300,979	5,390
Oysters	1,404,012	14,398
	cwt.	
Dublin Bay Prawns	14,072	31,559
Mussels	14,919	7,187
Periwinkles	42,304	56,892
Other Shellfish	390	783
TOTAL VALUE SHELLFISH	—	277,686
TOTAL VALUE ALL FISH	—	1,357,242

APPENDIX No. 2

Comparison of the Average Prices per cwt. of various kinds of Sea Fish for the years 1954-1961

	1954	1955	1956	1957	1958	1959	1960	1961
	£ s. d.	£ s. d.	£ s. d.	£ s. f.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Soles ..	11 5 5	11 5 0	12 11 4	15 6 7	14 5 10	14 14 5	14 4 2	15 6 5
Brill ..	8 9 10	8 15 3	9 11 4	9 14 11	8 0 0	9 9 7	9 6 9	10 2 3
Turbot ..	8 9 0	7 18 9	9 15 3	9 2 0	10 7 1	9 16 2	10 2 2	10 0 0
Plaice ..	7 11 2	7 3 7	7 2 3	7 8 9	8 3 6	8 8 8	8 2 8	8 5 1
Dabs ..	—	—	—	—	—	—	—	*2 15 3
Megrims ..	—	—	—	—	—	—	—	*3 8 3
Ray/Skate ..	2 12 11	2 8 8	2 9 3	2 6 7	2 15 3	3 15 5	3 6 4	3 7 5
Cod ..	5 1 4	4 14 0	4 12 6	4 5 6	4 14 0	5 9 11	5 7 6	6 1 6
Haddock ..	2 8 5	2 0 2	2 5 5	2 2 0	2 17 1	3 5 5	3 16 3	5 5 8
Hake ..	3 18 3	4 17 6	5 17 11	4 17 0	6 9 7	6 19 7	7 12 7	6 0 9
Whiting ..	1 12 8	1 12 0	1 9 2	1 3 4	1 5 3	1 9 4	1 14 8	1 19 11
Pollack ..	—	—	—	—	—	—	—	*2 15 1
Herrings ..	1 1 4	0 15 3	0 14 9	0 14 10	1 1 3	1 3 8	0 18 11	0 16 9
Pilchards ..	—	—	—	—	—	—	—	*0 7 8
Mackerel ..	1 9 9	1 12 9	1 15 10	1 11 7	1 2 4	1 11 11	1 11 4	1 11 10
Sprats ..	0 3 6	0 4 2	0 10 0	0 5 6	0 6 8	0 7 8	0 13 0	0 7 3

N.B.—"Average price" as shown in this table represents total value divided by total weight for each kind of fish, year by year. It does not purport to take direct cognizance of any abnormal rise or fall in price attributable to a seasonal glut or shortage of a particular kind of fish.

* Comparable figures for years prior to 1961 are not available for these varieties.

APPENDIX No. 3

IMPORTS AND EXPORTS OF FISH AND FISHERY PRODUCTS IN 1961

(as compared with 1960)

	Quantity		Value	
	1961	1960	1961	1960
I.—IMPORTS	cwt.	cwt.	£	£
Fish, fresh, chilled or frozen	23,315	21,901	115,521	104,889
Fish, cured—not in airtight containers	28,143	29,144	201,589	182,401
Fish and fish preparations in airtight containers ..	16,680	21,903	330,403	426,625
Other fish and fish preparations	3,582	6,163	49,023	52,290
TOTALS	71,720	79,111	696,536	766,205
II.—EXPORTS				
Fish, fresh, chilled or frozen :				
Salmon	9,289	10,920	402,797	474,322
Herrings	149,126	270,463	231,338	447,189
Fresh water eels ..	1,869	3,212	25,678	40,562
Other fish	8,199	19,753	62,684	52,783
Fish dried, salted or smoked not in airtight containers	23,986	54,164	85,613	160,260
Shellfish, fresh, chilled, frozen, salted, dried ..	56,434	77,477	381,488	408,905
Other fish and fish preparations	2,753	4,931	22,803	55,123
TOTALS	251,656	440,920	1,212,401	1,639,144

The figures given above for exports of salmon and trout include those relating to exports from the former Moville Fishery District now comprised in the Foyle Area.

APPENDIX No. 4

HERRING FISHING 1961

County	Ports at which more than 500 cwt. were landed	Total Quantity cwt.	Value £
Louth	Clogherhead	888	1,252
Dublin ..	Howth	4,345	3,690
Wicklow ..	——	525	938
Wexford ..	Cahore, Rosslare	2,427	4,073
Waterford ..	Dunmore East, Passage East	112,867	90,150
Cork	Kilcrohane, Castletownbere ..	4,011	3,334
Kerry	——	188	230
Clare	——	40	50
Galway ..	——	408	290
Mayo	Westport, Achill, Keel and Keem	13,521	10,786
Sligo	——	—	—
Donegal ..	Killybegs, Burton Port, Kincasslagh, Port and Inver, Bunbeg Buncrana, Teelin and Dooneen	110,858	94,917
	TOTALS	250,078	209,710

APPENDIX No. 5

MACKEREL FISHING, 1961

County	Ports at which more than 250 cwt. were landed	Total Quantity cwt.	Value £
Louth	——	51	89
Dublin ..	——	—	—
Wicklow ..	——	—	—
Wexford ..	Kilmore Quay, Duncannon ..	684	1,846
Waterford ..	Passage East, Dunmore East, Ballinagoul	3,396	6,202
Cork	Baltimore, Schull, Kinsale, Castletownbere, Ballycotton ..	13,881	20,347
Kerry	Sneem	1,574	1,986
Clare	——	428	1,323
Galway ..	Galway	1,086	2,388
Mayo	——	1,643	2,490
Sligo	——	220	300
Donegal ..	Killybegs	1,044	1,267
	TOTALS ..	24,007	38,238

APPENDIX No. 6

REGIONAL DISTRIBUTION AND CLASSIFICATION OF FISHING CRAFT AND OF PERSONNEL ENGAGED IN FISHING IN 1961

HOW ENGAGED (i.e whether solely or partially)	MEN	MOTOR VESSELS						SAIL BOATS			ROW BOATS		TOTAL VESSELS
		1st Class			2nd Class		3rd Class	1st Class	2nd Class		3rd Class	Unclassed A	Unclassed B	
		25 tons gross and over	20 tons gross and over but less than 25 tons	15 tons gross and over but less than 20 tons	10 tons gross and over but less than 15 tons and of 18' keel and upwards	Under 10 tons and of 18 feet keel and upwards.	Less than 18 feet keel	15 tons net and over but less than 20 tons	10 tons net and over but less than 15 tons and of 18 feet keel and upwards	Under 10 tons and of 18 feet keel and upwards.	Less than 18' keel	Open boats of 18' keel and upwards and canoes of 18' or more over all	Open boats of less than 18' keel and canoes of less than 18' over all	
EAST COAST														
Solely engaged ..	351	64	7	5	5	12	—	—	—	—	—	42	3	138
Partially engaged ..	288	1	—	3	1	16	—	—	—	3	1	53	7	85
Laid-up	—	3	—	—	—	6	—	—	—	1	—	4	—	14
TOTALS	639	68	7	8	6	34	—	—	—	4	1	99	10	237
SOUTH COAST														
Solely engaged ..	644	68	20	9	42	76	2	—	—	20	37	20	24	318
Partially engaged ..	1,056	—	—	2	4	59	4	—	—	37	19	40	113	278
Laid-up	—	—	1	—	—	10	—	—	—	—	—	—	—	11
TOTALS	1,700	68	21	11	46	145	6	—	—	57	47	60	137	607
WEST COAST														
Solely engaged ..	247	10	4	2	2	45	—	—	—	35	3	116	68	285
Partially engaged ..	1,416	—	—	2	—	28	—	—	—	27	13	119	162	351
Laid-up	—	—	—	—	—	1	—	—	—	—	—	—	—	1
TOTALS	1,663	10	4	4	2	74	—	—	—	62	16	235	230	637
NORTH COAST														
Solely engaged ..	389	31	4	3	3	92	—	—	6	50	3	115	21	328
Partially engaged ..	1,321	—	—	—	2	35	1	—	6	63	7	68	43	225
Laid-up	—	2	2	—	—	1	—	—	—	—	—	—	—	5
TOTALS	1,710	33	6	3	5	128	1	—	12	113	10	183	64	558
TOTALS FOR 1961														
Solely engaged ..	1,631	173	35	19	52	225	2	—	6	105	43	293	116	1,069
Partially engaged ..	4,081	1	—	7	7	138	5	—	6	130	40	280	325	939
Laid-up	—	5	3	—	—	18	—	—	—	1	—	4	—	31
TOTALS	5,712	179	38	26	59	381	7	—	12	236	83	577	441	2,039

APPENDIX No. 7

TRAWLING AND SEINING, 1961

Port or Locality	Number of men engaged	Number of boats engaged	Tonnage of Motor Boats			Fishing Period
			Not exceeding 10 tons	Over 10 tons	Over 15 tons	
Clogherhead	36	9	—	—	9	All year.
Balbriggan	40	9	—	—	9	All year.
Skerries	38	8	—	—	8	All year.
Howth	85	18	—	—	18	All year.
Dublin	12	3	2	—	1	Summer months only for smaller boats.
Dún Laoire	14	5	1	1	3	All year.
Wicklow	3	1	1	—	—	Summer months.
Arklow	90	22	1	2	19	All year.
Courtown Harbour	2	1	—	1	—	May to September.
Cahore	2	1	1	—	—	May to September.
Wexford	32	9	—	2	7	All year.
Rosslare	3	1	—	—	1	April to September.
Kilmore Quay	50	14	2	3	9	All year for 9 vessels over 15 tons. September to March for remainder.
Fethard-on-Sea	6	2	—	—	2	All year.
Barrow and Bar of Lough	2	1	1	—	—	September to April.
Duncannon	3	1	—	—	1	All year.
Passage East	12	3	—	3	—	All year.
Dunmore East	60	12	—	—	12	All year.
Helvick	15	3	—	—	3	All year.
Ballycotton	12	4	3	—	1	All year.
Youghal	4	2	2	—	—	Autumn months.
Cobh	6	3	3	—	—	All year.
Kinsale	6	2	2	—	—	All year.
Courtmacsherry	3	1	1	—	—	Winter months.
Union Hall and Raheen	37	8	—	3	5	All year (mainly).
Castletownshend	4	1	—	1	—	Winter months.
Baltimore	30	4	—	4	—	All year.
Schull	33	5	—	—	5	All year.
Castletownbere	40	7	—	—	7	All year.
Kilmackillogue	4	1	—	1	—	All year.
Ballinskelligs	5	2	—	1	1	Winter months.
Cahirciveen	17	3	—	—	3	All year.
Dingle	75	15	—	—	15	All year.
Fenit	5	1	1	—	—	Summer months.
Liscannor	3	1	1	—	—	All year.
Galway and Aran Islands	10	9	—	—	9	All year.
Roundstone	4	1	1	—	—	Spring and Autumn.
Cleggan and Inishboffin	18	4	2	—	2	All year.
Murrisk	4	1	—	—	1	All year.
Achill, Keel and Keem	20	4	—	2	2	All year.
Blacksod	4	1	—	—	1	Spring and winter.
Enniscrone	6	2	2	—	—	All year except winter.
Killybegs	45	26	—	—	26	All year.
Burtonport	35	7	—	—	7	All year.
Kincasslagh	4	1	—	—	1	All year.
Downings	4	1	—	—	1	All year.
Buncrana	8	2	—	—	2	All year.
Glengad	36	8	8	—	—	All year.
Greencastle	38	11	6	1	4	All year.
TOTAL	1,025	261	41	25	195	

APPENDIX No. 8

STATEMENT OF ACCOUNT

in respect of

Repayable Advances for the provision of boats and gear to fishermen made during the period of thirty years to 31st March, 1961, to the Irish Sea Fisheries Association, Ltd., to the date of the Association's dissolution, 23rd April, 1952, and to An Bord Iascaigh Mhara, as from that date.

	£		£
Repayable with Interest on an annuity basis in respect of :—		Repayments to 31st March, 1960	438,607
(*a*) Advances amounting to £1,231,927 made up to 31st March, 1960	1,975,362	Repayments made during year ended 31st March, 1961 ..	78,681
(*b*) Advances amounting to £150,500 made during year ended 31st March, 1961	257,864	Balance outstanding :—	
		Due in arrear £163,705	
		Instalments and interest not matured £1,552,233	
			1,715,938
	£2,233,226		£2,233,226

NOTE.—Advances made to the Association and the Board are repayable on the basis of a twenty year annuity in half-yearly instalments.

APPENDIX No. 9

COASTAL EXTENT OF FISHERY DISTRICTS AND NAMES OF THE PRINCIPAL RIVERS IN EACH DISTRICT

District	Coastal Extent of District	Principal Rivers
No. 1 Dublin	Most easterly point on Red Island, Skerries, to Wicklow Head.	Liffey Vartry.
No. 2 Wexford	Wicklow Head to Kiln Bay, east of Bannow Bay, Co. Wexford.	Slaney Avoca.
No. 3 Waterford	Kiln Bay, east of Bannow Bay, to Helvick Head, Co. Waterford.	Suir Barrow Nore.
No. 4 Lismore	Helvick Head to Ballycotton Pier, Co. Cork.	Blackwater, Funshion, Bride, Awbeg.
No. 5 Cork	Ballycotton Pier to Crow Head, Co. Cork.	Lee, Owenboy, Bandon, Argideen, Ilen, Mealagh, Owvane, Coomhola, Glengarriff, Adrigole.
No. 7 Kerry	Crow Head, Co. Cork, to Kerry Head, Co. Kerry.	Roughty, Sheen, Finnihy, Blackwater, Sneem, Laune, Flesk, Maine, Caragh, Currane, Cummeragh, Inny.
No. 8 Limerick	Kerry Head, Co. Kerry, to Hag's Head, Co. Clare.	Shannon, Deel, Fergus, Mulcair, Little and Upper Brosna, Inny, Maigue, Feale.
No. 9[1] Galway	Hag's Head to the sea point of the boundary between the townlands of Keeraunagark Sth. and Banraghbaun Sth., Co. Galway.	Corrib, Claregalway.
No. 9[2] Connemara	The sea point of the boundary between the townlands of Keeraunagark South and Banraghbaun South, Co. Galway, to Slyne Head, Co. Galway.	Ballinahinch, Recess, Casbla, Owengowla, Invermore, Inverbeg, Screebe, Furnace.
No. 10[1] Ballinakill	Slyne Head to Pigeon Point, Westport Bay, Co. Mayo.	Culfin, Errif, Bundorragha, Dawros, Carrowniskey, Bunowen (Louisburgh).
No. 10[2] Bangor	Pigeon Point to Benwee Head, Co. Mayo.	Newport, Burrishoole, Owenduff, Owengarve, Owenmore, Glenamoy.
No. 11 Ballina	Benwee Head to Coonamore Point, Co. Sligo.	Moy, Cloonaghmore (Palmerston), Easkey.

District	Coastal Extent of District	Principal Rivers
No. 12 Sligo	Coonamore Point to Carrickgarve, Co. Sligo.	Ballisodare, Garavogue (Sligo), Bonet, Drumcliff.
No. 13 Ballyshannon	Carrickgarve to Rossan Point, Co. Donegal.	Erne, Bundrowes, Bunduff, Eske, Eaney Water, Oily, Glen.
No. 14[1] Letterkenny	Rossan Point to Malin Head, Co. Donegal.	Owenea, Gweebarra, Gweedore (Crolly), Clady, Lackagh, Lennon, Crana.
No. 17[2] Dundalk	Carlingford Lough to Clogherhead, Co. Louth.	Fane, Dee, Glyde.
No. 17[1] Drogheda	Clogherhead to the most easterly point on Red Island, Skerries, Co. Dublin.	Boyne, Blackwater, Deel.

Note—The area comprised in the former No. 14[2] or Moville District was, by the Foyle Fisheries Act, 1952, incorporated in the Foyle Area which is administered by the Foyle Fisheries Commission.

APPENDIX No. 10

Quantity and Value of all Salmon and Sea Trout taken in 1959, 1960 and 1961 by Instruments of Capture.

SALMON

Instruments	1961	1960	1959	1961	1960	1959
Total for all engines	lb. 1,345,653	lb. 1,364,292	lb. 1,624,447	£ 410,381	£ 410,779	£ 482,527
Total for rod and line	193,376	230,423	259,912	65,023	76,475	77,204
Total for drift nets	218,248	263,521	352,505	58,255	70,672	104,708
Total for draft nets	741,305	701,186	865,830	225,698	210,580	257,187
Total for stake nets, weirs, etc.	192,724	169,162	146,200	61,405	53,052	43,428

SEA TROUT

Instruments	1961	1960	1959	1961	1960	1959
Total for all engines	lb. 90,102	lb. 61,948	lb. 77,723	£ 14,648	£ 10,712	£ 12,978
Total for rod and line	64,127	43,363	41,504	9,608	3,701	6,930
Total for drift nets	1,188	1,263	5,631	266	250	875
Total for draft nets	22,955	16,244	24,483	4,399	3,505	4,088
Total for stake nets, weirs, etc.	1,832	1,098	6,105	375	256	1,085

This Appendix does not include returns from the former Moville Fishery District.

APPENDIX No. 11

Quantity and Value of Salmon taken in 1959, 1960 and 1961, by Fishery Districts.

Fishery District	*	Quantity			Value		
		1961 lb.	1960 lb.	1959 lb.	1961 £	1960 £	1959 £
Dublin	R	2,095	4,935	4,451	948	2,019	1,593
	N	2,741	5,455	8,595	926	1,837	2,758
Wexford	R	9,834	19,060	35,089	3,550	6,630	10,713
	N	19,596	25,145	36,463	7,885	10,028	12,067
Waterford	R	22,289	32,690	36,891	8,277	10,854	10,636
	N	133,362	138,314	168,943	40,959	39,256	43,014
Lismore	R	22,110	23,501	33,047	6,947	8,249	9,119
	N	95,806	117,086	135,215	31,570	35,836	46,530
Cork	R	9,404	14,737	21,119	3,498	5,159	6,413
	N	35,794	30,664	79,530	10,779	8,974	23,186
Kerry	R	21,396	27,862	30,040	6,760	8,241	8,584
	N	119,555	93,596	131,060	36,674	25,477	36,106
Limerick	R	37,436	35,973	44,751	12,943	11,902	13,297
	N	141,236	131,903	155,595	42,992	43,297	50,438
Galway	R	3,250	674	1,102	1,127	206	324
	N	20,455	42,275	43,148	6,184	14,402	12,816
Connemara	R	3,362	2,274	2,395	1,025	652	624
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill	R	2,484	3,347	2,808	779	994	843
	N	12,454	14,310	16,459	2,828	3,003	3,384
Bangor	R	7,564	4,196	6,175	2,254	1,249	1,802
	N	58,328	56,422	57,736	14,041	15,194	12,228
Ballina	R	20,396	18,545	24,795	5,902	5,560	6,757
	N	256,283	195,173	247,282	73,675	57,800	89,003
Sligo	R	6,583	5,140	5,106	2,269	1,642	1,600
	N	44,773	39,402	21,587	12,655	9,625	5,181
Ballyshannon	R	3,812	4,436	2,523	1,351	1,507	768
	N	43,411	61,129	57,492	11,769	16,467	13,122
Letterkenny	R	12,145	14,349	11,812	3,571	4,072	3,128
	N	100,345	110,728	94,253	24,245	26,085	21,943
Dundalk	R	1,472	2,639	776	533	830	209
	N	23,599	24,358	29,080	7,507	7,349	7,450
Drogheda	R	7,744	16,065	13,093	3,289	6,709	4,696
	N	44,539	47,909	66,036	20,669	19,674	22,195
TOTALS		1,345,653	1,364,292	1,624,447	410,381	410,779	482,527

* R. indicates capture by means of single rod and line ; N by means of nets, weirs, etc.

APPENDIX No. 12

Quantity and Value of Sea Trout taken in 1959, 1960 and 1961, by Fishery Districts.

Fishery District	*	Quantity			Value		
		1961 lb.	1960 lb.	1959 lb.	1961 £	1960 £	1959 £
Dublin ..	R	1,098	1,244	2,040	214	206	291
	N	4,992	3,475	7,777	1,028	762	1,727
Wexford ..	R	2,006	1,421	1,600	293	214	222
	N	4,658	3,458	5,776	652	591	892
Waterford ..	R	932	963	805	135	142	117
	N	691	249	326	83	54	51
Lismore ..	R	749	642	322	100	51	49
	N	1,866	929	2,089	320	129	307
Cork ..	R	7,255	3,487	5,416	1,028	527	784
	N	961	178	995	169	27	131
Kerry ..	R	13,294	9,240	6,600	1,794	1,372	952
	N	1,647	1,397	4,507	377	293	836
Limerick ..	R	5,513	3,592	1,955	791	548	304
	N	4,956	5,300	6,837	1,278	1,489	1,473
Galway ..	R	1,568	574	352	262	109	55
	N	504	501	733	103	85	147
Connemara ..	R	12,765	8,275	7,431	2,018	1,328	1,186
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill ..	R	3,305	2,281	2,254	473	380	378
	N	740	715	1,093	104	106	155
Bangor ..	R	7,250	3,406	3,016	1,106	517	449
	N	1,585	556	1,269	311	106	211
Ballina ..	R	1,220	2,068	1,737	240	325	261
	N	236	96	16	30	12	4
Sligo ..	R	262	274	106	46	48	16
	N	184	Nil	191	35	Nil	29
Ballyshannon ..	R	1,143	692	653	170	106	94
	N	513	272	1,402	84	36	175
Letterkenny ..	R	3,239	3,214	2,435	512	458	352
	N	393	240	462	57	39	69
Dundalk ..	R	650	579	866	103	101	145
	N	714	352	1,359	129	63	246
Drogheda ..	R	1,878	1,411	3,950	323	269	641
	N	1,335	867	1,353	280	219	229
TOTALS ..		90,102	61,948	77,723	14,648	10,712	12,978

*R. indicates capture by means of single rod and line ;
N. by means of nets, weirs, etc.

APPENDIX No. 13

Quantity and Value of Eels taken in 1959, 1960 and 1961 by Fishery Districts.

Fishery District	Quantity			Value		
	1961 lb.	1960 lb.	1959 lb.	1961 £	1960 £	1959 £
Wexford ..	4,563	1,864	Nil	610	176	Nil
Waterford ..	6,513	38,266	9,101	477	4,566	788
Lismore ..	220	Nil	Nil	21	Nil	Nil
Cork ..	1,800	Nil	1,700	80	Nil	85
Limerick ..	109,770	58,568	65,520	13,926	9,792	8,567
Galway ..	61,431	67,677	63,201	7,454	9,123	6,666
Bangor ..	Nil	Nil	232	Nil	Nil	18
Ballina ..	7,937	36,340	16,245	943	3,770	1,546
Sligo ..	30,790	4,364	2,920	2,344	500	285
Ballyshannon ..	4,842	6,699	8,059	521	709	923
Dundalk ..	5,002	3,534	3,858	580	399	426
Drogheda ..	3,339	15,975	8,478	408	1,884	742
TOTALS ..	236,207	233,287	179,314	27,364	30,919	20,046

NOTE : The catch figures set out above are based on returns which are not complete. This explains any apparent inconsistency between the figures and the official export figures in any particular year.

APPENDIX No. 14

Total Quantity and Value of Salmon, Sea Trout and Eels taken by all engines in 1959, 1960 and 1961, by Fishery Districts.

Fishery District	Total Weight for District			Total Value for District		
	1961 lb.	1960 lb.	1959 lb.	1961 £	1960 £	1959 £
Dublin ..	10,926	15,109	22,863	3,116	4,824	6,369
Wexford ..	40,657	50,948	78,928	12,990	17,639	23,894
Waterford ..	163,787	210,482	216,066	49,931	54,872	54,606
Lismore ..	120,751	142,158	170,673	38,958	44,265	56,005
Cork ..	55,214	49,066	108,760	15,554	14,687	30,599
Kerry ..	155,892	132,095	172,207	45,605	35,383	46,478
Limerick ..	298,911	235,336	274,658	71,930	67,028	74,079
Galway ..	87,208	111,701	108,536	15,130	23,925	20,008
Connemara ..	16,127	10,549	9,826	3,043	1,980	1,810
Ballinakill ..	18,983	20,653	22,614	4,184	4,483	4,760
Bangor ..	74,727	64,580	68,428	17,712	17,066	14,708
Ballina ..	286,072	252,222	290,075	80,790	67,467	97,571
Sligo ..	82,592	49,180	29,910	17,349	11,815	7,111
Ballyshannon ..	53,721	73,228	70,129	13,895	18,825	15,082
Letterkenny ..	116,122	128,531	108,962	28,385	30,654	25,492
Dundalk ..	31,437	31,462	35,939	8,852	8,742	8,476
Drogheda ..	58,835	82,227	92,910	24,969	28,755	28,503
TOTALS ..	1,671,962	1,659,527	1,881,484	452,393	452,410	515,551

APPENDIX No. 15

Number, Quantity and Value of Salmon taken by Single Rod and Line in 1959, 1960 and 1961, by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1961	1960	1959	1961	1960	1959	1961	1960	1959
				lb.	lb.	lb.	£	£	£
Dublin ..	221	529	471	2,095	4,935	4,451	948	2,019	1,593
Wexford ..	982	1,813	3,615	9,834	19,060	35,089	3,550	6,630	10,713
Waterford ..	2,534	3,805	4,048	22,289	32,690	36,891	8,277	10,854	10,636
Lismore ..	2,747	2,522	3,528	22,110	23,501	33,047	6,947	8,249	9,119
Cork ..	1,143	1,623	2,701	9,404	14,737	21,119	3,498	5,159	6,413
Kerry ..	2,974	3,761	3,730	21,396	27,862	30,040	6,760	8,241	8,584
Limerick ..	4,650	4,368	5,095	37,436	35,973	44,751	12,943	11,902	13,297
Galway ..	524	85	141	3,250	674	1,102	1,127	206	324
Connemara ..	553	337	408	3,362	2,274	2,395	1,025	652	624
Ballinakill ..	434	452	391	2,484	3,347	2,808	779	994	843
Bangor ..	1,364	530	687	7,564	4,196	6,175	2,254	1,249	1,802
Ballina ..	3,296	2,708	2,832	20,396	18,545	24,795	5,902	5,560	6,757
Sligo ..	940	627	609	6,583	5,140	5,106	2,269	1,642	1,600
Ballyshannon	494	548	301	3,812	4,436	2,523	1,351	1,507	768
Letterkenny	1,710	2,005	1,454	12,145	14,349	11,812	3,571	4,072	3,128
Dundalk ..	163	257	86	1,472	2,639	776	533	830	209
Drogheda ..	620	1,229	1,241	7,744	16,065	13,093	3,289	6,709	4,696
TOTALS	25,349	27,199	31,338	193,376	230,423	275,973	65,023	76,475	81,106

APPENDIX No. 16

Number, Quantity and Value of Sea Trout taken by Single Rod and Line in 1959, 1960 and 1961 by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1961	1960	1959	1961	1960	1959	1961	1960	1959
				lb.	lb.	lb.	£	£	£
Dublin ..	1,234	1,466	2,700	1,098	1,244	2,040	214	206	291
Wexford ..	2,561	2,138	2,792	2,006	1,421	1,600	293	214	222
Waterford ..	1,093	1,204	1,024	932	963	805	135	142	117
Lismore ..	683	289	349	749	642	322	100	51	49
Cork ..	8,349	4,637	6,396	7,255	3,487	5,416	1,028	527	784
Kerry ..	9,902	7,952	5,584	13,294	9,240	6,600	1,794	1,372	952
Limerick ..	7,024	4,132	2,458	5,513	3,592	1,955	791	548	304
Galway ..	1,607	651	408	1,568	574	352	262	109	55
Connemara	13,928	8,849	8,361	12,765	8,275	7,431	2,018	1,328	1,186
Ballinakill ..	3,139	2,258	2,144	3,305	2,281	2,254	473	380	378
Bangor ..	7,174	3,801	3,277	7,250	3,406	3,016	1,106	517	449
Ballina ..	1,210	2,114	1,985	1,220	2,068	1,737	240	325	261
Sligo ..	212	341	126	262	274	106	46	48	16
Ballyshannon	1,041	648	556	1,143	692	653	170	106	94
Letterkenny	3,028	3,345	2,587	3,239	3,214	2,435	512	458	352
Dundalk ..	598	708	919	650	579	866	103	101	145
Drogheda ..	2,140	1,569	3,768	1,878	1,411	3,950	323	269	641
TOTALS	64,914	45,102	45,434	64,127	43,363	41,538	9,608	6,701	6,296

APPENDIX No. 17

PARTICULARS OF RECEIPTS AND EXPENDITURE OF BOARDS OF CONSERVATORS FOR THE YEAR ENDED 30TH SEPTEMBER, 1961

Fishery District	RECEIPTS						EXPENDITURE					
	Opening Balance	Licence Duty	Fishery Rate	Grant from Department	Miscellaneous Receipts	Total Receipts	Salaries	Water Keepers	Law Costs	Travelling and Miscellaneous	Total Expenditure	Closing Balance
	£	£	£	£	£	£	£	£	£	£	£	£
Dublin ..	—205	1,805	257	800	387	3,249	1,167	424	45	1,505	3,141	— 97
Wexford ..	— 78	1,498	1,380	350	145	3,373	650	1,734	44	850	3,278	+ 17
Waterford ..	—808	3,236	2,503	3,500	360	9,599	1,496	4,776	55	3,252	9,579	— 788
Lismore ..	232	1,475	5,742	1,400	159	8,776	986	6,603	130	2,013	9,732	— 724
Cork ..	1,924	2,056	1,130	2,500	147	6,833	822	3,961	359	1,782	6,924	+ 1,833
Kerry ..	2,211	2,454	2,846	1,500	296	7,096	1,068	4,202	10	1,913	7,193	+ 2,114
Limerick ..	3,228	3,541	3,094	4,000	4,355	14,990	1,256	6,267	512	5,736	13,771	+ 4,447
Galway ..	1,992	788	2,759	400	245	4,192	2,013	1,056	—	1,279	4,348	+ 1,836
Connemara ..	272	549	1,482	—	52	2,083	335	1,527	26	408	2,296	+ 59
Ballinakill ..	84	462	982	300	2	1,746	268	1,249	98	557	2,172	— 342
Bangor ..	988	990	1,098	600	203	2,891	986	1,291	—	989	3,266	+ 613
Ballina ..	469	961	3,236	100	233	4,530	625	3,279	213	954	5,071	— 72
Sligo ..	670	590	1,056	—	90	1,736	400	788	54	572	1,814	+ 592
Ballyshannon ..	836	926	510	2,529	265	4,230	588	2,536	—	1,530	4,654	+ 412
Letterkenny ..	1,905	2,459	1,672	324	188	4,643	733	3,236	59	1,173	5,201	+ 1,347
Drogheda ..	—139	1,529	1,508	1,295	82	4,414	556	2,284	22	1,544	4,406	— 131
Dundalk ..	347	553	493	750	44	1,840	328	784	205	643	1,960	+ 227
TOTALS ..	13,928	25,872	31,748	21,348	7,253	86,221	14,277	45,997	1,832	26,700	88,806	+11,343

APPENDIX No. 18

PARTICULARS OF LICENCES ISSUED BY BOARDS OF CONSERVATORS FOR THE YEAR 1961

Fishery District	Salmon Rod								Draft Net	Drift Net	Pole Net	Bag Net	Stake Net	Head Weir	Box or Crib	Loop Net	Snap Net	Gap Eye or Basket for Eels	Long Line for Eels	Eel Trap	Special Local Licences (Tidal Waters)	Oyster Dredge
	Annual (all districts)	Annual (district of issue)	Late season (all districts)	Twenty-one day (all districts)	Seven day (all districts)	Late season (district of issue)	Foyle Area extension (all districts)	Foyle Area extension (one district)														
Dublin ..	311	98	22	—	35	26	2	—	13	19	—	—	—	—	—	—	—	—	—	—	—	—
Wexford ..	119	106	—	—	118	93	—	—	99	—	1	—	—	—	—	—	—	1	—	—	—	—
Waterford ..	91	689	—	2	48	13	—	—	14	69	—	1	2	—	3	—	119	23	—	—	—	—
Lismore ..	49	233	5	2	247	—	—	—	11	57	—	—	2	—	1	—	10	1	—	—	—	—
Cork ..	202	246	7	—	110	95	—	—	36	11	—	—	—	—	1	—	—	1	1	—	—	—
Kerry ..	132	222	6	—	433	220	—	—	50	—	—	1	—	—	3	—	—	—	—	—	—	13
Limerick ..	118	714	2	—	53	16	—	—	87	72	—	—	4	—	4	—	—	36	20	—	—	—
Galway ..	35	27	35	—	128	26	—	—	9	—	—	—	—	—	5	—	—	25	6	—	—	67
Connemara ..	13	7	1	—	249	112	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ballinakill ..	5	24	8	—	160	66	—	3	11	—	—	—	—	—	—	—	—	—	—	—	—	—
Bangor ..	42	38	16	—	358	84	1	—	31	2	—	—	—	—	—	—	—	1	—	—	—	—
Ballina ..	27	88	14	—	147	28	—	—	16	42	—	—	—	—	7	—	—	42	—	—	—	—
Sligo ..	53	92	4	—	17	7	—	—	9	1	—	1	—	—	—	—	—	—	5	—	—	—
Ballyshannon ..	43	60	2	—	118	28	29	24	58	5	—	—	—	—	1	—	—	10	2	—	1	—
Letterkenny ..	46	358	5	3	278	111	30	130	42	41	—	—	—	—	2	27	—	2	—	—	11	—
Dundalk ..	41	57	3	—	1	27	5	28	20	—	—	—	—	—	—	—	—	9	1	—	—	—
Drogheda ..	155	134	10	—	33	6	4	—	83	—	—	—	—	—	6	—	—	15	—	—	—	—
TOTALS ..	1,482	3,193	140	7	2,533	967	71	185	589	319	1	3	8	—	33	27	129	166	35	—	12	80

APPENDIX No. 19

Licence Duties Payable on Fishing Engines

	£	s.	d.
On each Salmon Rod—Annual (valid all districts) ...	4	0	0
Do. Salmon Rod—Late Season (valid all districts)	3	0	0
Do. Salmon Rod—Twenty-one day (valid all districts)	3	0	0
Do. Salmon Rod—Seven day (valid all districts) ...	1	0	0
Do. Salmon Rod—Annual (valid district of issue only)	3	0	0
Do. Salmon Rod—Late Season (valid district of issue only)	2	0	0
Do. Salmon Rod—Foyle area extension (valid all districts)	2	10	0
Do. Salmon Rod—Foyle area extension (valid district of issue only)	1	10	0
On each—Draft net	4	0	0
Do. —Drift net	3	0	0
Do. —Snap net	2	10	0
Do. —Bag net	10	0	0
Do. —Stake net	30	0	0
Do. —Head Weir	6	0	0
Do. —Box or Crib	10	0	0
Do. —Gap, Eye or Basket for Eels	2	0	0
Do. —Long line for Eels	2	0	0
Do. —Oyster fishing engine	2	0	0

Licence Duties Payable on Fishing Engines other than those Mentioned Above

Fishery District	Pole Net	Loop Net	Eel Trap	Special Local Licences	
				Rod	Draft Net
	£ s.	£ s.	£ s.	£ s.	£ s.
1. Dublin	2 0	—	—	—	—
2. Wexford	2 0	—	—	—	—
3. Waterford	2 0	—	—	—	—
4. Lismore	2 0	—	—	—	—
5. Cork	2 0	—	—	—	—
7. Kerry	2 0	—	—	—	—
8. Limerick	2 0	—	—	—	—
9. Galway	2 0	—	15 0	—	—
9[3]. Connemara	2 0	—	—	—	—
10[1]. Ballinakill	2 0	—	—	—	—
10[2]. Bangor	2 0	—	—	—	—
11. Ballina	2 0	—	—	—	—
12. Sligo	2 0	—	—	—	—
13. Ballyshannon	2 0	—	2 0	*3 0	*25 0
14[1]. Letterkenny	2 0	0 10	—	‡3 0	†12 10 ‡20 0
17[1]. Drogheda	2 0	0 10	2 0	—	—
17[2]. Dundalk	2 0	—	—	—	—

‡ River Lackagh Tidal Waters. * River Erne Tidal Waters.
† River Owenea Tidal Waters.

APPENDIX No. 20

PARTICULARS OF PUBLIC INQUIRIES HELD DURING 1961

Date of Inquiry	Where Held	Subject Matter	Minister's decision on considering Report of Inquiry
18 January, 1961	Letterfrack	Application for an order for the establishment of an oyster fishery in part of Barnaderg Bay.	Application refused.
16 February, 1961	Tralee	The devising of measures for the more effectual government, management, protection and improvement of the oyster fisheries in Tralee Bay.	Bye-laws made.
27 June, 1961	Castlebar	Proposed restrictions on angling for trout in lakes and tributary streams of Castlebar River system upstream of Castlebar Town.	Bye-law to be made.
16 August, 1961	Kilrush	Application for an order for the establishment of an oyster fishery in part of tidal waters of River Shannon.	Order granted.
17 August, 1961 18 August, 1961	Kilrush Glin	Application for an order for the establishment of an oyster fishery in part of tidal waters of River Shannon.	Order granted.
30 August, 1961	Kilmeena	Prohibition during a period not exceeding three years ending on the 30 September, 1964, of the dredging for, taking, catching or destroying of oysters or oyster brood in Clew Bay, in the vicinity of Quinsheen, Co. Mayo.	Bye-law made.

APPENDIX No. 21

ABSTRACT OF STATUTORY INSTRUMENTS MADE IN 1961

ORDERS

Fishing Nets (Regulation of Mesh) (Amendment) Order, 1961 (S.I. No. 76 of 1961), dated 14 April, 1961

PERMITTING up to 4 April, 1963, the use of certain fishing nets having a smaller mesh than that specified in the Fishing Nets (Regulation of Mesh) Order, 1954.

River Erne (Special Local Licence Duty) (Method of Payment) (Amendment) Order, 1961 (S.I. No. 165 of 1961), dated 5 August, 1961.

PROVIDING that the licence duty in respect of a special local licence for the River Erne shall be payable in full on application.

River Erne (Special Local Licences) (Amendment) Order, 1961 (S.I. No. 166 of 1961), dated 5 August, 1961.

PROVIDING that the special local licence duty payable in respect of a draft net for use in the tidal waters of the River Erne shall be £5.

Fisheries (Delegation of Ministerial Functions) Order, 1961 (S.I. No. 258 of 1961), made by the Government on 14 November, 1961.

DELEGATING to the Parliamentary Secretary to the Minister for Lands the specified powers and duties of the Minister for Lands in relation to fisheries.

Oyster Fishery (River Shannon) Order, 1961, dated 13 November, 1961.

GRANTING to Randal Counihan of 8, Lanarone Avenue, Limerick, and Enda J. Cantillon of Rosedell, Florence Road, Bray, Co. Wicklow, the exclusive right of depositing, propagating, dredging and fishing for and taking oysters in that part of the River Shannon described in the Schedule to the Order.

Oyster Fishery (River Shannon) (No. 2) Order, 1961, dated 13 November, 1961.

GRANTING to the S.O. Company Limited of 72 St. Stephen's Green, Dublin, the exclusive right of depositing, propagating, dredging and fishing for and taking oysters in that part of the River Shannon described in the Schedule to the Order.

BYE-LAWS

Ballyshannon District Netting Bye-law No. 505, 1961, dated 7 August, 1961.

PERMITTING the use of draft nets not exceeding 85 yards in length for taking salmon or trout during the period from 7 August, 1961, to 19 August, 1961, in a specified portion of the tidal waters of the River Erne, notwithstanding the prohibitions contained in Ballyshannon District Bye-law No. 503, 1960.

Tralee Bay Oysters Bye-Laws No. 506, 1961, dated 18 September, 1961.

PRESCRIBING a minimum size limit of three inches for any oyster taken from the Tralee Bay oyster beds. PRESCRIBING restrictions on the number and size of dredges to be used in oyster fishing there and REVOKING the By-laws, Rules and Regulations for the Oyster Fisheries of Tralee Bay, dated 4 November, 1912, the By-law for the Oyster Fisheries of Tralee Bay, dated 16 March, 1916, and the Tralee Bay Oysters By-law No. 380, 1926.

Tralee Bay Oysters Close Season Bye-law No. C.S. 109, 1961, dated 18 September, 1961.

FIXING the close season for oysters on the oyster beds in Tralee Bay to be 1 March to 30 September in each year and REVOKING the Tralee Bay Oysters Close Season By-law No. 379, 1926.

Clew Bay Oyster Bye-law No. 507, 1961, dated 26 October, 1961.

PROHIBITING the taking of oysters or oyster brood in a specified portion of Clew Bay during the period from 10 November, 1961, to 30 September, 1964.

APPENDIX No. 22

OUTPUT OF OVA IN 1960/61

Hatchery	River system stocked	Salmon ova (,000)	Sea Trout ova (,000)	Brown Trout ova (,000)
Lismore ..	32,000 ova distributed to hatching stations throughout the State ..	32	—	—
Mallow ..	River Blackwater and tributaries	900	—	—
Inistioge ..	River Nore and tributaries ..	50	—	—
Loughrea ..	Lough Rea	—	—	80
Parteen ..	Shannon	1,351	—	—
Lough Ennell	Lough Ennell	—	—	20
Lough Owel	1,077,750 transferred to the Inland Fisheries Trust Inc., remainder to Lough Owel	—	—	1,194
Fanure ..	Various Trust Waters ..	—	—	204
Oughterard ..	Lough Corrib and tributaries ..	—	—	250
Inver ..	Inver River System	—	65	—
Screebe ..	Screebe River	21	39	—
Ballisodare ..	Ballisodare River and tributaries	80	—	—
Ballyshannon	Erne	601	—	—
Lee ..	Lee	715	—	—
Glenties ..	1,205,000 salmon ova distributed to hatching stations throughout the State ; remainder to Rivers Owenea and Owentocker ; 36,000 sea trout ova to Inland Fisheries Trust, Incorporated	1,500	36	—
	TOTAL ..	5,250	140	1,748

APPENDIX No. 23

LIST OF SCIENTIFIC AND OTHER PAPERS BY OFFICERS OF THE FISHERIES DIVISION PUBLISHED DURING THE YEAR 1961 (OTHER THAN THOSE APPENDED TO THIS REPORT)*

CONNOLLY, J. N., A note on *Crystallogobius linearis* (= *C. nilssoni*) off the west coast of Ireland. *Irish Nat. Jour.* XIII, 276.

O'RIORDAN, C., Occurrence of *Urophycis blennoides* (Brünnich) the greater fork-beard, off the south coast of Ireland. *Irish Nat. Jour.* XIII, 211-3.

————————. A variation of flounder, *Platichthys flesus* (L.) from Co. Wexford. *Irish Nat. Jour.* XIII, 213-4.

WENT, ARTHUR E. J., Rare fish taken in Irish waters in 1960. *Irish Nat. Jour.* XIII, 204-211.

————————. Notes on some large Irish brown trout. *Salmon and Trout Mag.* No. 162. May, 1961.

* In addition to these papers officers of the Division contributed papers (not subsequently published) to the meetings of the International Council for the Exploration of the Sea, the Challenger Society and the Salmon Research Group. (See pages 15 and 16).

APPENDIX No. 24

HERRING INVESTIGATIONS ON THE SOUTH AND EAST COASTS OF IRELAND—1961/62

By

JOHN BRACKEN, PH.D., Assistant Inspector

Samples of adult herrings from Dunmore East and Rosslare were examined throughout the season. Beach-seining for whitebait (immature or small herring sometimes mixed with other species) was continued on the south and east coasts from July to October, 1961, the effort being concentrated on the east coast from Rosslare Strand, Co. Wexford, to Carlingford Lough, Co. Louth. Monthly searches for herring larvae from the spawning areas were carried out by the exploratory vessel *Cú Feasa* using a "tin-tow net", a special filtering device for plankton. These surveys commenced in January and ended in March, 1962, and extended, as in the previous season, from the Fastnet, Co. Cork, to Cahore Point, Co. Wexford. In addition, the *Cú Feasa* also carried out extensive echo-surveys in the Dunmore fishery which afforded a valuable service for the fishing fleet in the pursuit of herring shoals in November and December.

1. *The Dunmore East Herring Fishery* 1961/62: Fishing opened on October 11th, 1961, but had to be suspended a few days later because of a prolonged period of unfavourable weather. Fishing was resumed at the end of October and continued with regular landings up to February 8th, 1962, when the main fleet left the grounds. Landings after February 8th up to the close of the season at the end of that month did not amount to more than about 900 crans. Fifty-seven boats taking part in the fishery landed at Dunmore East and used the following types of gear:—

Trawls and purse seines	31
Ring nets	21
Drift nets (boats of about 28')	5

Landings were made on 78 days out of a possible 118. Altogether, 29,120 crans were landed during the season—a decrease of 35,324 crans or approximately 55% on the figures for 1960/61. Ring-nets accounted for 12,080 crans, the remainder being taken by bottom or mid-water trawls, purse-seines and drift nets. As in previous seasons, the major portion of the catch before Christmas was landed from ring-nets. After Christmas, the landings by trawlers increased and predominated by the end of the season.

The location of the fishery was similar to that of the previous season. The shoals were first located off the Keraghs, close to the shore, in 10 fathoms. Estuarine fishing was again predominant during

the November/December period. After Christmas, fishing was confined mainly to Baginbun Bay. Monthly landings were as follows:—

October	1,270	cran
November	5,340	„
December	13,950	„
January	6,560	„
February	1,800	„
March	200	„
	29,120	„

The catch was disposed of as follows:—

Fresh—Home trade	3,460	cran
Great Britain	14,860	„
Fresh, frozen, klondyked, rough packed (Germany, Netherlands, France and Czechoslovakia) ...	10,800	„
	29,120	„

Samples of herrings were obtained from October 12th until January 30th and were examined for length, sex, maturity and age. The number of vertebrae in the backbone of each fish were counted and the otoliths or "ear stones" were retained for further examination. Vertebral and otolith characteristics vary in the different races of herring and evidence of this kind is needed to determine whether the Dunmore herring stocks are composed of a single race. Table 1 summarises the age distribution of the fish examined.

TABLE 1—Age Distribution for 1961/62

Age in years ..	2	3	4	5	6	7	8	9	10	10+	Totals
No. of Winter Rings	1	2	3	4	5	6	7	8	9	10	
October ..	1	9	28	41	5	9	5	3	2	2	105
November ..	28	229	254	49	24	13	13	6	5	4	625
December ..	43	167	397	59	19	38	15	19	11	8	776
January ..	16	65	111	18	10	12	6	5	5	2	250
TOTALS ..	88	470	790	167	58	72	39	33	23	16	1,756

The dominant age groups were found to be 3 and 4 year olds. The 1957 year class which entered the fishery as a very strong recruit brood (3 year olds) during the 1960/61 season was again dominant this season. A reasonably good recruitment of the 1958 year class also took place. The maturity stages were dissimilar to those of the previous three seasons. In October, November and December the

gonads were developing (early Stage V), becoming full in late January (Stage VI). A small percentage of spents was present in the catches throughout the season. The stages of maturity of the fish examined before Christmas would suggest that fishing could have extended in 1962 well beyond the normal point.

2. *Echo-surveys*: From November 15th to December 2nd, extensive echo-surveys were carried out by the *Cú Feasa* from Carnsore Point, Co. Wexford, to Youghal, Co. Cork. Elac sounder and Asdic were used continuously during these surveys with a high degree of success. For each area searched a systematic grid was set up consisting of a series of parallel lines, 1 mile apart, and usually 8 miles long. The offshore lines were traversed first using the Asdic (horizontal range 1,000 yards) and the search continued inshore. It was noted that, when working in shallow water (less than 10 fathoms), the reverberations from the bottom tended to obscure fish traces and the normal echo-sounder was used instead of the Asdic.

On November 17th, the *Cú Feasa* located herrings in Ballyteige Bay, 2 miles east of the Keraghs. In response to a general call, three boats arrived in the area and caught a large quantity. The vessel again located herrings for the fleet in the area Brownstown Head to Bunmahon Bay on November 27th and heavy catches were reported. Several small shots of herring were taken from a small shoal located by the *Cú Feasa* on December 2nd. The outcome of searches by the *Cú Feasa* depends, of course, on the confidence and co-operation of the fleet.

3. *Adult sampling from Rosslare*: The 1961/62 season in the Rosslare area commenced in November and continued until the end of December. Fishing was confined to a narrow coastal strip 1 to 2 miles off Rosslare Strand. A total of 266 fish were examined during the season and the age distributions obtained are summarised in Table 2.

TABLE 2—Age distribution—1961 (Rosslare)

Age in years ..	2	3	4	5	6	7	8	Unreadable	Total
No. of Winter Rings	1	2	3	4	5	6	7		
No. of Fish ..	28	194	37	1	1	–	1	4	266

The dominant age groups recorded were 3, 4 and 2-year olds. The length range was 21 to 28 cms., the dominant length groups being 23-25 cms. The first year length measurements (calculated from the scales) and other characteristics were very similar to those of the Dunmore herrings and suggest that the shoals in both fisheries originated from the same stock. As shown from the beach-seine results in the next section, the herrings aged less than a year examined from both areas also appear to belong to the same stock.

4. *Beach-seine and sprat-weir data*: Since November, 1959, a large-scale study of the O-group herring (herrings less than 1 year old), has been undertaken on the east, south-east and south coasts of Ireland. A knowledge of the young herring during this phase of their life is very important in order to relate them to the adult fish and to determine the extent to which the larvae have dispersed from the spawning areas. The O-group herring form an integral part of the whitebait in the shallow estaurine and tidal waters around our coasts.

In 1959 samples were collected from the so-called sprat-weirs on the estuary of the Blackwater and Waterford Harbour. Monthly beach-seining investigations were later carried out on the south and south-east coasts from Knockadoon Bay, Co. Cork, to Blackwater Head, Co. Wexford, during the period July to October, 1960. In the summer and autumn of 1961, the main beach-seining effort was concentrated on the south-east and east coasts from Rosslare, Co. Wexford, to Carlingford Lough, Co. Louth. Sampling on the south coast during 1961 was confined to Waterford Harbour and the estuary of the Blackwater. Generally O-group herrings were found to be abundant in these two estuaries. Only small numbers were taken at places between those estuaries, including Ardmore and Dunbrattin, Co. Waterford. No young herrings were taken west of Youghal, Co. Cork. To the east of Waterford Harbour, O-group herrings were sparsely distributed although fair numbers had been taken at Rosslare Strand, Co. Wexford, in 1960. No young herrings were taken from Rosslare Strand to Howth, Co. Dublin, during 1961 despite a concentrated effort in that area. From Clogherhead to Carlingford Lough, Co. Louth, however, O-group herrings were found to be fairly abundant.

Measurements of the total length of the O-group herrings examined during the period of investigation, irrespective of the method of capture, lie within the range 4 to 19 cms. (1.5 to 7.5 ins.). The O-group herrings taken on the south coast, where recruitment to the adult stocks is of a complex nature, were found to be bigger than those taken in the Irish Sea. Recruitment to the Dunmore fishery can occur over three age classes—2, 3 and 4-year old fish. The main recruitment of a particular year brood takes place when the fish are 3 years old. However, a small percentage of the same year brood may enter the fishery as fast-growing 2-year olds, or, alternatively, as slow-growing 4-year olds as has been ascertained from an examination of the scales of adult fish collected at Dunmore East. It is possible to calculate the growth of an adult fish from an examination of its scales and this growth can be related to actual length measurements available for O-group herrings of the same year brood. Thus for the 1959 year brood which should enter the Dunmore fishery as normal 3-year old recruits during the 1962/63 season, the mean length measurements after 1 year's growth can be calculated from their scales and compared directly with those of the O-group herring

of the same year class sampled during the first beach seining operations in 1959. This comparison should assist in determining the extent of the Dunmore nursery areas and clarifying the system of recruitment to the fishery.

5. *Larval surveys off the south and east coasts*: In addition to the adult sampling programme at Dunmore East monthly larval surveys have been undertaken during the past two seasons and will need to be continued. The *Cú Feasa*, using a modified Gulf III High Speed tow net, has sampled an area extending from Cahore Point, Co. Wexford, to Fastnet, Co. Cork. The 1960/61 surveys show that the main spawning period during that season was January, 1961. A small percentage of larvae was taken in the southern Irish Sea which confirms the diffusion from the spawning areas as illustrated by the O-group herring taken in the Irish Sea. The 1961/62 larval surveys show that up to the end of February no major concentration of larvae was found and this is in accordance with the available data on the maturity of the adults examined in Dunmore during the 1961/62 season.

It is expected that these continuing investigations will lead to conclusions of considerable benefit in the future exploitation of the Dunmore East fishery. The assistance received from skippers and others in the carrying out of the investigations has proved to be most helpful and their continued co-operation will be greatly appreciated.

APPENDIX No. 25

SALMON OF THE BUNDORRAGHA RIVER

Results of reading a small collection of scales

By

ARTHUR E. J. WENT, Inspector and Scientific Adviser

In 1960 Mr. W. A. Wallace of the Old Head Hotel, lessee from the Marquis of Sligo, of Delphi fisheries which comprise the Bundorragha River and its lakes, kindly made a collection of scales of sea trout and salmon taken on rod and line in the Bundorragha river system. An account of the sea trout of the river system in 1960 has already been published (see Went, 1962, "Irish Sea Trout", *Sci. Proc. R. Dublin Soc.* Scr. A. *1.* No. 10.) As the salmon material for 1960 was rather small Mr. Wallace kindly collected further sets of scales for 1961. Altogether 140 satisfactory sets of salmon scales with relevant data as to weight, length and date of capture, were collected in 1960 and 1961 and these form the basis of this short paper.

Four age groups were identified as follows:—

Age group	*Number*	*Percentage*
Grilse (1 + winters)	33	23.6
Small spring fish (2 winters) ...	93	66.4
Small summer fish (2 + winters) ...	5	3.6
Previous spawners (with sm's) ...	9	6.4
TOTAL	140	100.0

Although the proportion of the different age groups in this series may not be indicative of the strength of the various age groups in the runs of salmon into the river as a whole, it is obvious that a large proportion of the rod catch is of spring fish. The proportion of previous spawners was about average for rivers of this type in Irish waters, i.e. with lakes on the system.

Only two smolt ages were identified, namely, the two and three year smolt classes, 90% belonging to the two-year smolt class and 10% to the three-year smolt class. This is quite unlike the conditions in the sea trout in which the proportions of two and three year smolts were 33.7% and 59.2%, respectively (see Went, 1962, *op cit.*). As is usual with salmon in the west of Ireland the bulk of the smolts were of type B, amounting to 89.3% of the total, as will be seen from the following table:—

Smolt age	*Smolt type*		*Total*
	A	*B*	
2	7.6%	82.4%	90.0%
3	3.1%	6.9%	10.0%
TOTAL	10.7%	89.3%	100.0%

All of the previous spawners examined had only a single spawning mark on their scales and all had adopted the long absence habit. The total age distribution of the fish was as follows:—

3 *group**	4 *group**	5 *group**	6 *group**
30 (21.5%)	91 (65.0%)	10 (7.1%)	9 (6.4%)

* Fish in their fourth, fifth, sixth and seventh year, respectively.

This is, of course, the type of age distribution expected in most Irish rivers in which generally one year class predominates in any one calendar year.

The minimum, average and maximum weights and lengths were as follows:—

Age group	Number examined	Weight in lb. Min.	Aver.	Max.	Length in ins. Min.	Aver.	Max.
Grilse (1 + winters)	... 33	2.0	4.9	9.5	18.5	23.0	28.5
Small spring fish (2 winters)	... 93	6.5	9.6	17.3	26.0	29.0	35.5
Small summer fish (2 + winters)	... 5	8.0	9.8	11.5	27.5	29.3	30.0
Previous spawners (With S.M.'s)	... 9	10.3	13.1	19.5	29.5	32.6	36.5

As is usual with Irish salmon stocks there is considerable overlap between the various age group as regards both the weight and length.

Measurements of the scales were used to calculate the growth of each maiden or unspawned fish throughout every life. The results, as far as the freshwater (parr) growth in inches is concerned, are given in the following table:—

Smolt Class	Smolt Type							
	A.				B.			
	Length at end of			Length at migration	Length at end of			Length at migration
	1st year	2nd year	3rd year		1st year	2nd year	3rd year	
2	2.5	5.5	–	5.5	1.9	5.0	–	5.1
3	1.7	3.7	5.6	5.6	1.7	3.4	5.5	5.9

The average smolt size was calculated to be about 5.2 inches, perhaps a little lower than average for Irish waters as a whole. It will be seen that the fastest growing fish migrated first and that there is a tendency for type A smolts to be smaller and faster growing than type B smolts of the same smolt class, all of which is quite in accord with work done on the salmon of other Irish rivers.

APPENDIX No. 26

SALMON OF THE RIVER OWENEA, 1926-29

By

ANN HEWETSON, M.Sc., Assistant Inspector

Introduction :—

The River Owenea in Co. Donegal is a small spate river 16¼ miles long and has a catchment area of 44½ square miles (Hely-Hutchinson, 1901). It rises in Groveenananta mountain and flows in a westerly direction emptying itself into Loughrosmore Bay. The highest level in the catchment is 1,568 feet. The system supports one small lake, Lough Ea, situated at the head streams. This river is managed by the Fisheries Division, Department of Lands, and during the period to which this survey relates, i.e. 1926 to 1929 inclusive, this Department, or as it was then known, the Department of Lands and Fisheries, operated two draft nets for the capture of salmon in the tidal portion of the river. Subsequently in 1935 the net fishery was declared a public one and since that time an average of eleven draft nets have fished in the estuary under special local licence.

Material and methods :—

The material upon which this investigation was based consisted of 1,239 satisfactory sets of scales taken from salmon captured in the two draft nets operated in the estuary between 1 June and 21 July in the years 1926 to 1929 inclusive. Each fish was measured from the tip of the snout to the fork of the tail to the nearest tenth of an inch and data relating to weight, sex and date of capture were recorded. A comparison with the catch records of the fishery for the years in question proved that the percentage of fish sampled was more than adequate. Furthermore, the figures have been adjusted by suitable arithmetical calculations and the resultant weighted figures used whenever possible in the tables.

Smolt ages :—

Over 86% of the fish migrated as two-year old smolts (Table 1). This dominancy of two-year old smolts is to be expected and is consistent with results obtained from the majority of other Irish rivers. The percentage of one-year old smolts is, however, lower than average.

The proportion of the different smolt types A and B, as described by Went (1938), is given in Table 2. Type A smolts are those with little or no growth rings laid down on the scales during the spring of the year in which they descended to the sea and type B smolts are those with a number of growth rings laid down during this period.

Age-groups :—

As will be obvious from the duration of the fishing season, the fishery is predominantly a summer fish one. In the years in question

the grilse (1 + winters) and small summer fish (2 + winters) together formed 92% of the total catch (Table 3). Six different groups of fish occurred in the catches; five groups of maiden or unspawned fish and one group comprising all fish with spawning marks on their scales (denoted the symbols "With S.M.'s"). The most important single age-group were the small summer fish which formed over 46% of the total catch. Commercially they were even more important, contributing 63.7% by weight. The grilse were next in importance comprising 45.4% of the catch numerically. The percentage of previous spawners (3.6%) was small and approximately two-thirds of these were taken in June. A similarly small percentage (2%) of previous spawners was recorded from the Owenea by Went in 1945.

Table 4 gives the absence habit of the previously spawned fish, i.e. the length of time spent feeding in the sea between successive spawning migrations. The term "short absence" habit denotes less than a full year spent feeding in the sea, "long absence" habit one full year and "very long absence" more than one full year. Four fish had two spawning marks on their scales. All had originally spawned as grilse and showed the short absence habit.

Divided migration and return:—

The years in which the fish examined were hatched is given in Table 5. In 1926 over 83% of the salmon were fish in their fourth year of life which had spent two years in the river and a little more than one full year in the sea whereas in the two subsequent years the bulk of the fish were in their fifth year of life having spent a further year feeding in the sea. In 1929, however, no particular year-class showed dominancy.

Size distribution:—

The frequency distribution of sizes is given in Table 6 showing that 80% of the grilse fell into the length groups between 21.95—25.95 inches while over 73% of the summer fish had lengths between 27.95 and 31.95 inches.

Condition coefficients and average sizes:—

The condition coefficient (K) is the relationship between the weight and length of a fish and may be determined by using the following formula: $K = 10^5 W/36L^3$, where W = weight in pounds and L = length in inches. The resultant figure may vary between 0.8 in the case of a poorly fed fish and 1.3 in the case of an exceptionally fat specimen. The very large summer fish (3 + winters) showed the highest condition coefficient and the small spring fish (2 winters) and previous spawners the lowest (Table 7). Further details of the condition of the individual groups of fish together with details of weight and length are given in Table 8, while the minimum, mean and maximum weights and lengths are given in Table 9. The smallest fish caught was a grilse (2 lbs. and 18.5 ins.), and the largest a previous spawner (28 lbs. and 39.6 ins.).

Calculated lengths :—

The length of each fish at the end of every winter of river and sea life was calculated on the assumption that there is direct proportion between the growth of the scale and the growth of the fish. On this basis back calculation of the lengths of 1,036 fish with satisfactory sets of scales was carried out. Tables 10 and 11 relate to the smolt length showing that the fastest growing smolts migrate first and that the type A smolts were longer than the type B smolts of the same smolt class at the end of each year in fresh water. Finally the lengths at the end of each winter of sea life are given in Table 12.

Summary :—

1. This investigation was based on the examination of scales and data relating to weight, length and date of capture of 1,239 salmon taken by draft nets in the tidal waters of the River Owenea during the years 1926-1929 inclusive.

2. The fishery is predominantly a summer fish one; the grilse and small summer fish together formed 92% of the total catch. The percentage of previous spawners was small (3.6%).

3. Among the smolt classes the two-year old class predominated, forming over 86% of the total.

4. Fish in their fifth year of life formed the bulk of the catch in 1927 and 1928. In 1926, however, the dominant group were in their fourth year of life, while in 1929 no particular year-class predominated.

5. All age groups of fish were in good condition on the average condition coefficient being 1.11.

6. Details are given relating to minimum, mean and maximum weights and lengths. The smallest fish caught was a grilse (2 lbs. and 18.5 ins.) and the largest a previous spawner (28 lbs. and 39.6 ins.).

7. The length of each fish at the end of every winter of river and sea life was calculated, and comparisons are drawn between the growth rates of the individual groups of fish.

References :—

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TABLE 1—Percentage of each smolt age in each age-group

Smolt Class	Age-group (in winters)						Total Maiden Fish
	1+	2	2+	3	3+	With S.M.'s	
1	1.5	—	2.6	—	—	—	2.0
2	87.7	91.9	85.4	100.0	100.0	86.1	86.8
3	10.8	8.1	12.0	—	—	13.9	11.2
TOTAL ..	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 2—Estimated proportion (%) of the different smolt types in each smolt class (maiden fish only)

Smolt Age	Type A.	Type B.
One year	—	2.0 (24)
Two years	23.5 (284)	63.3 (751)
Three years	10.7 (129)	0.5 (6)
TOTAL	34.2 (413)	65.8 (781)

TABLE 3—Percentage composition of the catches numerically and by weight

Percentage of Total Catch	Age-groups (in winters)						Total
	1+	2	2+	3	3+	With S.M.'s	
% numerically ..	45.4	3.7	46.6	0.2	0.5	3.6	100.0
% by weight ..	24.8	4.9	63.7	0.4	1.1	5.1	100.0

TABLE 4—Absence habit of previous spawners.

Absence habit	Age at first spawning (in winters)			Total
	1+	2	2+	
Short	22	—	8	30
Long	—	2	—	2
Very Long	3	—	10	13
TOTAL	25	2	18	45

TABLE 5—Divided migration and return—A table showing the years in which the fish were hatched (percentages of the total runs).

Returned in 1926 as :	Hatched in the year					Total
	1920	1921	1922	1923	1924	
Grilse (1+winters) ..	—	—	9.8	73.3	0.4	83.5
Small spring fish (2 winters) ..	—	—	1.0	—	—	1.0
Small summer fish (2+winters) ..	—	1.4	12.2	0.8	—	14.4
Previous spawners (with S.M.'s) ..	0.3	0.6	0.2	—	—	1.1
TOTAL ..	0.3	2.0	23.2	74.1	0.4	100.0

Returned in 1927 as :	Hatched in the year					Total
	1921	1922	1923	1924	1925	
Grilse (1+winters) ..	—	—	1.4	28.6	0.5	30.5
Small spring fish (2 winters) ..	—	1.0	7.8	—	—	8.8
Small summer fish (2+winters) ..	—	5.8	51.2	1.0	—	58.0
Large spring fish (3 winters) ..	—	0.7	—	—	—	0.7
Previous spawners (with S.M.'s) ..	0.8	0.7	0.5	—	—	2.0
TOTAL ..	0.8	8.2	60.9	29.6	0.5	100.0

Returned in 1928 as :	Hatched in the years					Total
	1922	1923	1924	1925	1926	
Grilse (1+winters) ..	—	—	2.6	8.8	0.4	11.8
Small spring fish (2 winters) ..	—	—	2.1	—	—	2.1
Small summer fish (2+winters) ..	—	6.3	71.4	2.5	—	80.2
Large summer fish (3+winters) ..	—	1.3	—	—	—	1.3
Previous spawners (with S.M.'s) ..	3.8	0.4	0.4	—	—	4.6
TOTAL ..	3.8	8.0	76.5	11.3	0.4	100.0

Returned in 1929 as :	Hatched in the year					Total
	1923	1924	1925	1926	1927	
Grilse (1+winters) ..	—	—	4.2	17.6	1.7	23.5
Small spring fish (2 winters) ..	—	—	2.9	—	—	2.9
Small summer fish (2+winters) ..	—	12.7	45.0	0.8	—	58.5
Large summer fish (3+winters) ..	—	1.6	—	—	—	1.6
Previous spawners (with S.M.'s) ..	0.6	7.4	5.5	—	—	13.5
TOTAL ..	0.6	21.7	57.6	18.4	1.7	100.0

TABLE 6—Frequency distribution of sizes in the different age-groups

Class interval in ins.*	Age-groups (in winters)						Total
	1+	2	2+	3	3+	With S.M.'s	
18	1.2	—	—	—	—	—	1.2
20	5.2	—	—	—	—	—	5.2
22	17.3	—	—	—	—	0.2	17.5
24	19.4	0.1	1.0	—	—	0.2	20.7
26	2.3	0.1	4.1	—	—	0.7	7.2
28	—	1.9	16.6	—	—	0.5	19.0
30	—	1.5	17.8	—	1.1	0.6	20.0
32	—	0.1	6.1	0.1	—	0.5	6.8
34	—	—	1.0	—	0.3	0.2	1.5
36	—	—	—	0.1	0.1	0.4	0.6
38	—	—	—	—	—	0.3	0.3
TOTAL	45.4	3.7	46.6	0.2	0.5	3.6	100.0

* Class interval 18 inches includes all fish having lengths between 17.95 and 19.95 inches, etc.

TABLE 7—The average condition coefficient (K.) in the different age-groups

Age-groups (in winters)	Condition co-efficient
1+winters	1.11
2 winters	1.07
2+winters	1.12
3 winters	1.09
3+winters	1.14
With S.M.'s	1.07
TOTAL ..	1.11

TABLE 8—AVERAGE SIZES IN THE DIFFERENT AGE GROUPS AND SMOLT CLASSES (LENGTH IN INCHES, WEIGHT IN POUNDS)

Smolt Age	Grilse (1+ winters)									All Smolts		
	1			2			3					
	lbs.	ins.	K.	lbs.	ins.	K.	lbs.	ins.	K.	lbs.	ins.	K.
1926 ..	5	24.0	1.11	5.2	23.5	1.10	5.3	23.7	1.11	5.2	23.5	1.11
1927 ..	5	23.0	1.11	5.6	23.9	1.12	4.9	22.8	1.11	5.6	23.9	1.10
1928 ..	2.3	20.1	0.91	5.2	23.1	1.10	4.8	22.4	1.21	5.0	22.9	1.10
1929 ..	4.7	23.6	1.00	4.0	23.6	1.21	5.4	23.3	1.21	5.4	23.2	1.21
Total ..	4.7	22.6	1.11	5.3	23.6	1.11	5.4	23.5	1.12	5.3	23.6	1.11
Small Spring Fish (2 winters)												
1926 ..	—	—	—	8.5	28.3	1.04	—	—	—	8.5	28.3	1.04
1927 ..	—	—	—	10.9	30.1	1.08	11.1	30.9	1.04	10.8	30.5	1.08
1928 ..	—	—	—	9.3	29.2	1.03	—	—	—	9.3	29.2	1.03
1929 ..	—	—	—	9.9	29.4	1.08	—	—	—	9.9	29.4	1.08
Total ..	—	—	—	10.2	29.7	1.07	11.1	30.9	1.04	10.3	30.1	1.07
Small Summer Fish (2+ winters)												
1926 ..	11.4	30.5	1.11	11.5	29.7	1.11	9.8	29.0	1.13	11.1	30.1	1.12
1927 ..	10.7	30.2	1.09	12.1	30.9	1.12	10.7	29.7	1.12	10.5	30.8	1.12
1928 ..	13.0	31.4	1.13	10.8	29.7	1.12	9.9	29.3	1.08	10.8	29.8	1.12
1929 ..	11.2	30.5	1.12	11.2	29.9	1.13	11.4	29.8	1.17	11.3	29.9	1.14
Total ..	11.8	29.4	1.12	11.4	30.3	1.12	10.7	29.6	1.13	11.3	30.2	1.12
Large Spring Fish (3 winters)												
1926 ..	—	—	—	—	—	—	—	—	—	—	—	—
1927 ..	—	—	—	15.9	34.1	1.09	—	—	—	15.9	34.1	1.09
1928 ..	—	—	—	—	—	—	—	—	—	—	—	—
1929 ..	—	—	—	—	—	—	—	—	—	—	—	—
Total ..	—	—	—	15.9	34.1	1.09	—	—	—	15.9	34.1	1.09
Large Summer Fish (3+ winters)												
1926 ..	—	—	—	—	—	—	—	—	—	—	—	—
1927 ..	—	—	—	—	—	—	—	—	—	—	—	—
1928 ..	—	—	—	13.7	32.2	1.14	—	—	—	13.7	32.2	1.14
1929 ..	—	—	—	19.1	35.7	1.14	—	—	—	19.1	35.7	1.14
Total ..	—	—	—	16.8	34.2	1.14	—	—	—	16.8	34.2	1.14
Previous Spawners (with S.M.'s)												
1926 ..	—	—	—	10.0	29.9	1.04	10.0	30.4	0.99	10.0	30.2	1.02
1927 ..	—	—	—	15.5	32.9	1.09	—	—	—	15.5	32.9	1.09
1928 ..	—	—	—	18.3	35.4	1.12	11.0	29.9	1.14	17.6	34.9	1.12
1929 ..	—	—	—	10.1	28.9	1.10	7.8	27.1	1.08	9.8	28.7	1.09
Total ..	—	—	—	13.3	31.5	1.01	9.1	28.7	1.06	13.1	31.1	1.01

TABLE 9—The minimum, mean, and maximum sizes in the different age-groups

Grilse (1+winters)

Number of fish examined=513

	lbs.	ins.	Date of capture :
Minimum	2.0	18.5	24 June, 1926
	2.75	18.1	19 July, 1928
Mean	5.3	23.6	—
Maximum	10.0	27.4	3 July, 1929

Small Spring Fish (2 winters) :

Number of fish examined=50

	lbs.	ins.	Date of capture :
Minimum	6.0	25.2	8 June, 1926
Mean	10.3	30.1	—
Maximum	13.75	31.5	9 June, 1927
	13.5	33.9	9 June, 1927

Small Summer Fish (2+winters) :

Number of fish examined=621

	lbs.	ins.	Date of capture :
Minimum	5.0	24.4	28 June, 1929
Mean	11.3	30.2	—
Maximum	20.25	38.6	8 June, 1927

Large Spring Fish (3 winters) :

Number of fish examined=3

	lbs.	ins.	Date of capture :
Minimum	12.5	32.3	7 June, 1927
Mean	15.9	34.1	—
Maximum	19.75	36.0	8 June, 1927

Large Summer Fish (3+winters) :

Number of fish examined=7

	lbs.	ins.	Date of capture :
Minimum	11.25	30.3	5 June, 1929
Mean	16.7	34.2	—
Maximum	23.5	37.2	3 June, 1929

Previously Spawned Fish (with S.M.'s) :

Number of fish examined=45

	lbs.	ins.	Date of capture :
Minimum	5.0	23.4	28 June, 1929
Mean	12.7	31.1	—
Maximum	28.0	39.6	1 June, 1927

TABLE 10—Mean calculated lengths in inches in fresh water

Smolt Age	Number	Length at end of			Mean Smolt Length
		1st year	2nd year	3rd year	
1	21	2.4	—	—	4.2
2	905	1.7	4.1	—	4.7
3	110	1.2	2.9	4.7	5.0

TABLE 11—Mean calculated lengths in inches in fresh water in the various smolt classes and types

Smolt Age	Type A Smolts					Type B Smolts				
	Number	Length at end of			Mean Smolt Length	Number	Length at end of			Mean Smolt Length
		1st year	2nd year	3rd year			1st year	2nd year	3rd year	
1	—	—	—	—	—	21	2.4	—	—	4.2
2	215	1.7	4.5	—	4.5	690	1.4	3.8	—	4.8
3	105	1.2	3.1	5.1	5.1	5	1.1	2.7	4.1	4.7

TABLE 12—Mean calculated lengths in inches in the sea in the various age-groups

Age-Group	Numbers	Length at end of		
		1st Sea Winter	2nd Sea Winter	3rd Sea Winter
1+winters ..	453	18.2	—	—
2 winters ..	32	19.0	29.6	—
2+winters ..	546	18.5	28.4	—
3 winters ..	2	18.3	27.8	34.9
3+winters ..	3	17.5	27.4	33.5

APPENDIX No. 27

SALMON OF THE RIVER CORRIB IN 1959, 1960 and 1961

By

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Introduction

Two previous investigations have been conducted into the composition of the stocks of salmon entering the River Corrib. The first of these related to the stocks of the years 1924 to 1926, inclusive (Went, 1943) and the second to the years 1956 to 1958, inclusive (Hewetson, 1958). The present investigation refers to the years 1959, 1960 and 1961 and is based on a study of 1,119 sets of salmon scales together with data relating to weight, length and date of capture. The number of fish sampled in each year was as follows:—

Year	*No of fish*
1959	419
1960	363
1961	337
	1,119

The bulk of the scales came from salmon captured either in the draft nets or in the weirs of the Galway Fishery but in 1960 and 1961 there were a few sets from rod caught fish also. The calculation of the percentages of the different groups of salmon occurring in the stocks has been based on the total catch figures of the Fishery for the years in question. This method served to obviate any unavoidable fluctuations in sampling techniques and the resultant weighted figures have been used whenever possible in the tables.

Smolt ages

The distribution of the three smolt ages occurring in each age-group is given in Table 1. The proportion of two-year old smolts among the maiden fish in each year was about 80% which figure is slightly higher than that recorded previously from the River Corrib. The proportion of one-year old and three-year old smolts showed approximately similar limits of variation. A more detailed analysis of the distribution of the one-year old smolts is given in Table 2.

Smolt types

The smolt classes have been divided into two types. Those with scales showing freshwater growth during the spring of the year in which migration to the sea as smolts took place are designated type B smolts and those with very little or no such growth are classified type A smolts. The highest proportion of type A smolts (over 38%) was recorded in 1960 (Table 3).

Age-Groups

The Fishery is predominantly a grilse fishery and for the three years in question the percentage of grilse (1 + winters) in the catches was remarkably constant, varying from 71.2% in 1961 to 72.4% in 1960 (Table 4). These figures show an increase of 10% in the grilse population over the figure of 61.4% recorded from the Corrib previously by Went (*op. cit.*). They are, however, roughly of the same order as those recorded during the years 1956 and 1957. Among the maiden fish the small spring fish (2 winters) were next in order of dominance. The large spring fish were not represented in the catches in 1959 and formed only 0.5% of the total catch during the two subsequent years. It has been shown in former surveys (Went, 1945, 1947), Hewetson (*op. cit.*) that previously spawned fish (with S.M.'s) have formed a high percentage of the catch of salmon in this Fishery and the years under review proved no exception. In 1961 the proportion of previous spawners was 17.2% which is the highest percentage of previously spawned fish recorded for any river in Ireland to date. The bulk of these were taken in July each year.

The spring fish formed the highest proportion of the catch during the months of February, March and April (Table 5). The small summer fish (2 + winters) were dominant in May and thereafter the grilse predominated with the peak of the grilse run occurring in June in 1960 and in July in 1959 and 1961 (Table 6). The proportion of spring fish as opposed to summer fish is given in Table 7 while the commercial importance of the various age-groups is illustrated in Table 8 showing that in 1961 the previous spawners formed over one-quarter of the total catch of the fishery by weight. Table 9 summarises the absence habit of the previous spawners and as was to be expected the spring fish showed the long absence habit in all cases and the majority of the grilse showed the short absence habit.

Brood years

The individual groups of fish have been related to their brood years in Table 10. As was to be expected the majority of the salmon in all three years were fish belonging to the 2.1 + group, that is, they had migrated to the sea as two-year old smolts and were returning to spawn for the first time as grilse. The oldest fish, a previous spawner taken in 1960, was in its tenth year (wt. 27 lb., lt. 40.0 ins.). It had spawned twice previously and when captured was returning to spawn for the third successive time. Very few fish of this kind have been identified from Irish waters previously.

Condition coefficient

The condition coefficient (K) is a measure of the relationship between the weight and length of a fish and is calculated according to the formula:—

$K = 10^{a}W/36L^{3}$, where W = weight in lb. and L = length in inches.

This formula gives a figure slightly higher than unity for normally fed Irish salmon. The condition coefficients of the principal age-groups of salmon are given in Table 11. The small summer fish showed the highest condition coefficient, the lowest being shown consistently by the previous spawners.

Average sizes

Details relating to the minimum, mean and maximum weights and lengths of the five major age-groups are given in Table 12.

Calculated Lengths

Back calculation of the length at the end of each year of life was carried out for 383 sets of scales taken from salmon captured in 1959, on the assumption that the growth of the fish was directly proportional to the growth of the scale. Tables 13 and 14 refer to the growth rate during the freshwater period showing that fish migrating as one-year old smolts made the most rapid growth in their first year. Similarly the mean length of the two-year old smolts was higher than that of the three-year old smolts at the end of the first and second years. In all cases the fastest growing fish migrated first. The average smolt length was 5.2 ins. Approximately 5% of the scales showed unusually large smolt growth varying from 7.0 to 10.0 ins. Such smolts have been recorded during both previous surveys of the Corrib salmon. Details of the lengths of the individual groups of fish at the end of every winter of sea life are given in Tables 15 and 16.

Summary

1. This investigation has been based on the examination of 1,119 sets of salmon scales and relevant data from salmon captured in the River Corrib during the years 1959, 1960 and 1961.

2. About 80% of the fish were derived from two-year old smolts.

3. The Fishery is predominantly for grilse which formed just over 70% of the catch in each year. The percentage of previous spawners was high ; 17.2% of the catch in 1961 was formed of previously spawned fish which figure is the highest recorded from any river in Ireland to date. Commercially in 1961 they were even more important, forming over one-quarter of the total catch by weight.

4. An examination of the brood years showed that the majority of the fish were in their fourth year of life while the oldest fish was in its tenth year.

5. The highest average condition coefficient was shown by the small spring fish and the lowest by the previous spawners.

6. Back calculation of the lengths at the end of every winter of river and sea life was carried out and details of both river and sea growth have been given.

Acknowledgment

I wish to record my thanks to the owners of the Galway Fishery, H. Barber & Son, Limited, who so kindly collected the material upon which this paper was based.

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TABLE 1—The percentage of each smolt age in each age-group

Smolt Class	Age Groups (in winters)					
	1+	2	2+	3	With S.M.'s	Total Maiden Fish
			1959			
1	9.4	16.7	27.4	—	5.7	12.0
2	84.9	72.0	70.2	—	84.3	81.7
3	5.7	11.3	2.4	—	10.0	6.3
Total	100.0	100.0	100.0	—	100.0	100.0
			1960			
1	4.1	19.6	28.2	20.0	4.6	7.6
2	81.4	66.0	60.9	80.0	82.7	78.2
3	14.5	14.4	10.9	—	12.7	14.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
			1961			
1	10.2	13.5	27.0	20.0	1.1	11.4
2	80.8	83.8	70.2	80.0	82.0	80.5
3	9.0	2.7	2.8	—	16.9	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 2—The percentage of one-year smolts in each month in the more important age-groups

	1959					1960						1961					
	Age-groups (in winters)					Age-groups (in winters)						Age-groups (in winters)					
	1+	2	2+	With S.M.'s	Total for maiden fish	1+	2	2+	3	With S.M.'s	Total for maiden fish	1+	2	2+	3	With S.M.'s	Total for maiden fish
Feb./Mar.	—	13.5	—	22.2	13.5	—	17.9	—	*33.3*	—	19.4	—	2.9	—	*25.0*	*12.5*	5.1
April ..	—	14.0	26.3	—	17.4	—	22.2	33.3	—	—	23.9	—	28.0	27.3	—	—	27.0
May ..	18.2	26.7	22.7	*50.0*	22.9	—	13.3	26.9	—	—	16.7	—	18.2	27.8	—	*50.0*	24.1
June ..	3.9	—	57.1	—	7.4	2.6	—	*25.0*	—	*11.4*	3.8	7.1	—	*25.0*	—	—	24.1
July ..	11.2	—	—	—	11.1	6.7	—	—	—	—	6.7	10.8	—	—	—	—	8.3
Total ..	9.4	16.7	27.4	5.7	12.0	4.1	19.6	28.2	20.0	4.6	7.6	10.2	13.5	27.0	20.0	1.1	11.4

The figures in italics were derived from a small number of observations.

TABLE 3—The estimated proportion (%) of the different smolt types in each smolt class (maiden fish only).

Smolt Age	1959		1960		1961	
	Type A	Type B	Type A	Type B	Tupe A	Type B
One year ..	—	12 0 (52)	—	7 6 (40)	—	11.4 (39)
Two years ..	21.1 (81)	60.6 (225)	24.3 (63)	53.9 (183)	23.2 (61)	57.4 (174)
Three years..	5.4 (27)	0.9 (4)	13.8 (36)	0.4 (2)	7.9 (20)	0.1 (2)
Total ..	26.5 (108)	73.5 (281)	38.1 (99)	61.9 (225)	31.1 (81)	68.9 (215)

Figures in brackets indicate numbers of fish examined

TABLE 4—The estimated monthly catch in each age-group as percentage of the yearly total.

Month	Age-groups (in winters)					Total
	1+	2	2+	3	With S.M.'s	
	1959					
Feb./Mar.	—	5.2	—	—	0.9	6.1
April ..	—	5.0	1.9	—	0.3	7.2
May ..	2.2	3.0	4.4	—	0.4	10.0
June ..	20.3	—	1.4	—	0.6	22.3
July ..	48.9	—	0.7	—	4.8	54.4
Total ..	71.4	13.2	8.4	—	7.0	100.0
	1960					
Feb./Mar.	—	2.8	—	0.3	0.5	3.6
April ..	—	5.4	1.5	0.2	0.4	7.5
May ..	1.3	1.5	2.6	—	0.6	6.0
June ..	42.6	—	2.3	—	4.4	49.3
July ..	28.5	—	—	—	5.1	33.6
Total ..	72.4	9.7	6.4	0.5	11.0	100.0
	1961					
Feb./Mar.	—	3.5	—	0.4	0.8	4.7
April ..	—	2.5	1.1	0.1	0.3	4.0
May ..	—	1.1	1.8	—	0.2	3.1
June ..	8.5	0.3	0.8	—	0.9	10.5
July ..	62.7	—	—	—	15.0	77.7
Total ..	71.2	7.4	3.7	0.5	17.2	100.0

TABLE 5—The percentage of each age-group in the catch of each month.

Month	Age-groups (in winters)					Total
	1+	2	2+	3	With S.M.'s	
	1959					
Feb./Mar.	—	85.2	—	—	14.8	100.0
April ..	—	69.4	26.4	—	4.2	100.0
May ..	22.0	30.0	44.0	—	4.0	100.0
June ..	91.0	—	6.3	—	2.7	100.0
July ..	89.9	—	1.3	—	8.8	100.0
Total ..	71.4	13.2	8.4	—	7.0	100.0
1960						
Feb./Mar.	—	77.8	—	8.3	13.9	100.0
April ..	—	72.0	20.0	2.7	5.3	100.0
May ..	21.7	25.0	43.3	—	10.0	100.0
June ..	86.4	—	4.7	—	8.9	100.0
July ..	84.8	—	—	—	15.2	100.0
Total ..	72.4	9.7	6.4	0.5	11.0	100.0
1961						
Feb./Mar.	—	74.5	—	8.5	17.0	100.0
April ..	—	62.5	27.5	2.5	7.5	100.0
May ..	—	35.5	58.1	—	6.4	100.0
June ..	81.0	2.9	7.6	—	8.5	100.0
July ..	80.7	—	—	—	19.3	100.0
Total ..	71.2	7.4	3.7	0.5	17.2	100.0

TABLE 6—The percentage of the total of each age-group in each month.

Month	Age-groups (in winters)					Total
	1+	2	2+	3	With S.M.'s	
	1959					
Feb./Mar.	—	39.4	—	—	12.9	6.1
April ..	—	37.9	22.6	—	4.3	7.2
May ..	3.1	22.7	52.4	—	5.7	10.0
June ..	28.4	—	16.7	—	8.6	22.3
July ..	68.5	—	8.3	—	68.5	54.4
Total ..	100.0	100.0	100.0	—	100.0	100.0
1960						
Feb./Mar.	—	28.9	—	60.0	4.5	3.6
April ..	—	55.7	23.4	40.0	3.6	7.5
May ..	1.8	15.4	40.6	—	5.5	6.0
June ..	58.8	—	36.0	—	40.0	49.3
July ..	39.4	—	—	—	46.4	33.6
Total ..	100.0	100.0	100.0	100.0	100.0	100.0
1961						
Feb./Mar.	—	47.3	—	80.0	4.7	4.7
April ..	—	33.8	29.7	20.0	1.7	4.0
May ..	—	14.9	48.6	—	1.2	3.1
June ..	11.9	4.0	21.7	—	5.2	10.5
July ..	88.1	—	—	—	87.2	77.7
Total ..	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 7—The proportion of spring and summer fish in the different months of the season.

Month	1959		1960		1961	
	Spring Fish	Summer Fish	Spring Fish	Summer Fish	Spring Fish	Summer Fish
Feb./Mar. ..	100.0	—	100.0	—	100.0	—
April ..	73.6	26.4	80.0	20.0	72.5	27.5
May ..	30.0	70.0	35.0	65.0	41.4	58.6
June ..	—	100.0	—	100.0	2.8	97.2
July ..	—	100.0	—	100.0	—	100.0
Total ..	14.9	85.1	11.7	88.3	9.2	90.8

TABLE 8—The percentage composition of the catches numerically and by weight.

Age-groups (in winters)	Percentage of Catch numerically	Percentage of Catch by weight
	1959	
1+	71.4	54.1
2	13.2	19.7
2+	8.4	13.1
3	—	—
With S.M.'s	7.0	13.1
Total	100.0	100.0
	1960	
1	72.4	58.5
2	9.7	13.7
2+	6.4	9.9
3	0.5	1.2
With S.M.'s	11.0	16.7
Total	100.0	100.0
	1961	
1+	71.2	56.4
2	7.4	10.4
2+	3.7	5.4
3	0.5	1.2
With S.M.'s	17.2	26.6
Total	100.0	100.0

TABLE 9—The absence habit* of previously spawned fish

Absence Habit	1959				1960				1961		
	Age at first spawning (in winters)				Age at first spawning (in winters)				Age at first spawning (in winters)		
	1+	2	2+	Total	1+	2	2+	Total	1+	2	Total
Short ..	8	—	1	9	21	—	2	23	26	—	26
Long ..	—	20	—	20	—	13	—	13	—	13	13
Very long ..	1	—	—	1	2	—	1	3	2	—	2
Total ..	9	10	1	30	23	13	3	39	28	13	41

* The absence habit is the length of time spent feeding in the sea between successive spawning migrations :
Short absence = Less than one full year
Long absence = One Full year
Very long absence = More than one full year

TABLE 10—Divided migration and return as percentages of the total runs.

Returned in 1959 as :—	Hatched in the year						
	1951	1953	1954	1955	1956	1957	Total
Grilse	–	–	–	4.1	60.6	6.7	71.4
Small spring fish ..	–	–	1.5	9.5	2.2	–	13.2
Small summer fish ..	–	–	0.2	5.9	2.3	–	8.4
Previous spawners ..	0.2	3.5	1.1	2.2	–	–	7.0
Total	0.2	3.5	2.8	21.7	65.1	6.7	100.0

Returned in 1960 as :—	Hatched in the year							
	1951	1953	1954	1955	1956	1957	1958	Total
Grilse ..	–	–	–	–	10.5	58.9	3.0	72.4
Small spring fish ..	–	–	–	1.4	6.4	1.9	–	9.7
Small summer fish..	–	–	–	0.7	3.9	1.8	–	6.4
Large spring fish ..	–	–	–	0.4	0.1	–	–	0.5
Previous spawners..	0.3	0.8	4.5	1.1	4.0	0.3	–	11.0
Total ..	0.3	0.8	4.5	3.6	24.9	62.9	3.0	100.0

Returned in 1961 as :—	Hatched in the year							
	1953	1954	1955	1956	1957	1958	1959	Total
Grilse ..	–	–	–	–	6.4	57.5	7.3	71.2
Small spring fish ..	–	–	–	0.2	6.2	1.0	–	7.4
Small summer fish..	–	–	–	0.1	2.6	1.0	–	3.7
Large spring fish ..	–	–	–	0.4	0.1	–	–	0.5
Previous spawners..	0.4	0.4	6.3	3.8	6.3	–	–	17.2
Total ..	0.4	0.4	6.3	4.5	21.6	59.5	7.3	100.0

TABLE 11—The mean condition coefficient (K) in the different age-groups.

Age-groups (in winters)	Year		
	1959	1960	1961
1+	1.10	1.14	1.12
2	1.15	1.13	1.11
2+	1.14	1.14	1.13
3	—	1.16	1.16
With S.M.'s	1.10	1.11	1.07
Spring fish	1.15	1.13	1.11
Summer fish	1.11	1.14	1.12

TABLE 12—The minimum mean and maximum sizes in the different age-groups.

(1) Grilse (1+winters)

	1959			1960			1961		
	No. examined=180			No. examined=180			No. examined=151		
	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture
Minimum	3.0	20.25	19 June	2.5	17.75	16 June	2.5	19.5	8 July
Mean	5.8	24.5	—	6.4	24.8	—	5.7	24.0	—
Maximum	12.0	29.5	29 June	11.5	28.5	16 July	12.0	30.0	20 July
				10.75	28.75	11 July			

(2) Small spring Fish (2 winters)

	1959			1960			1961		
	No. examined=159			No. examined=97			No. examined=97		
	lbs.	ins.	Date of capture	lbs.	ins	Date of capture	lbs.	ins.	Date of capture
Minimum	6.0	25.5	19 March	6.25	24.5	3 May	4.25	21.75	28 June
Mean	11.4	30.1	—	11.2	30.1	—	10.2	29.3	—
Maximum	21.5	36.0	6 April	19.5	34.75	23 April	22.5	38.0	22 March
				17.75	35.0	7 May			

(3) Small summer fish (2+winners)

	1959			1960			1961		
	No. examined = 50			No. examined = 42			No. examined = 42		
	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture
Minimum	5.0	23.5	12 June	9.5	28.25	25 April	4.75	23.5	31 May
Mean	11.9	30.5	—	12.3	30.9	—	10.6	29.5	—
Maximum	23.5	37.0	2 April	17.5 17.0	34.25 34.5	3 May 4 May	18.5	34.5	5 May

(4) Large Spring Fish (3 winters)

	1959			1960			1961		
	No. examined = 0			No. examined = 5			No. examined = 7		
	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture
Minimum	—	—	—	14.0	32.5	8 March	9.75	28.25	29 March
Mean	—	—	—	19.6	36.9	—	17.3	34.1	—
Maximum	—	—	—	23.0	38.5	26 April	25.5	39.0	7 March

(5) Previous Spawners (with S.M.'s)

	1959			1960			1961		
	No. examined = 30			No. examined = 39			No. examined = 41		
	lbs.	ins.	Date of capture	lbs.	ins.	Date of capture	lbs.	ns.	Date of capture
Minimum	5.5	24.0	14 July	5.25	24.25	10 June	4.0	21.75	19 July
Mean	14.4	32.1	—	12.0	30.6	—	11.1	29.5	—
Maximum	29.0 28.5	38.0 40.0	14 Feb. 25 Feb.	27.0	40.0	18 March	28.5	42.5	9 May

TABLE 13—Calculated growth in fresh water in the different smolt classes (1959).

Smolt age (in years)	No.	The mean length in inches at the end of			Mean smolt length in inches
		1st winter	2nd winter	3rd winter	
1	49	2.3	—	—	3.6
2	304	1.6	4.6	—	5.4
3	30	1.4	3.6	5.8	5.9

TABLE 14—Calculated lengths in fresh water for the different smolt types in the three smolt classes (1959).

Smolt Class	Growth Type									
	A.					B.				
	No.	Length in inches at end of			Mean smolt length in inches	No.	Length in inches at end of			Mean smolt length in inches
		1st winter	2nd winter	3rd winter			1st winter	2nd winter	3rd winter	
1	—	—	—	—	—	49	2.3	—	—	3.6
2	78	1.8	4.9	—	4.9	226	1.5	4.4	—	5.5
3	26	1.4	3.8	6.0	6.0	4	1.1	2.8	4.7	5.8

TABLE 15—Calculated mean lengths at the end of each winter in the sea together with the average smolt lengths (1959).

Age-groups (in winters)	No.	Mean smolt length	The mean length in inches at the end of			Mean length at capture
			1st sea winter	2nd sea winter	3rd sea winter	
1+ ..	178	5.3	20.2	—	—	24.5
2 ..	158	5.2	19.9	—	—	30.1
2+ ..	47	4.6	19.7	28.6	—	30.5

TABLE 16—Calculated mean length in inches at the end of each winter of river and sea life (1959)

Age-groups (in winters)	No.	River Life			Mean Smolt length in inches	Sea Life			Mean length at capture
		Length at end of				Length at end of			
		1st winter	2nd winter	3rd winter		1st winter	2nd winter	3rd winter	
1 1+	13	2.2	—	—	3.4	20.1	—	—	24.9
2 1+	152	1.5	4.6	—	5.5	20.3	—	—	24.5
3 1+	13	1.1	3.1	5.2	5.5	19.9	—	—	23.6
1 2	23	2.4	—	—	3.7	19.1	29.9	—	29.9
2 2	119	1.7	4.6	—	5.4	20.0	30.2	—	30.2
3 2	16	1.6	4.0	6.3	6.3	21.1	30.3	—	30.3
1 2+	13	1.8	3.6	—	3.6	18.8	28.4	—	30.3
2 2+	33	1.6	3.4	—	4.9	19.6	29.0	—	30.8
3 2+	1	1.7	5.3	5.9	5.9	21.3	29.4	—	31.0

APPENDIX No. 28

REPORT ON FISH FARM DEMONSTRATION UNITS CONSTRUCTED IN 1960

Lay out

Two units were set up, one at Tooreen, Glen of Aherlow, Co. Tipperary, on the land of Mr. Lucius F. Leonard, and the second at Blackwater, Enniscorthy, Co. Wexford, on the land of Mr. Thomas F. O'Donoghue. Each was a typical five pond unit consisting of four ponds for rearing fish and one as a standby used to a limited extent for rearing but intended primarily to facilitate the grading of the fish and periodical cleaning of the ponds. Four raceways were provided for the rearing of fry until they would be transferred to the larger ponds ; these raceways were located between the rearing ponds. A feed channel was provided to supply water to the ponds and raceways and a drainage channel to return the water to the river.

From observing the operation of these units it has been found that the number of raceways could be reduced by two and that the work of the fish farmer would be facilitated by placing them some distance from the rearing ponds. It has also become apparent that use can be made of the drainage channel for the rearing of fish if it is increased in size and made somewhat deeper. The layout of units constructed subsequent to those at Aherlow and Enniscorthy has been altered accordingly.

Construction costs

(*a*) AHERLOW

Because of the physical features of this site the construction cost amounted to £557 which is considerably in excess of what has been estimated as the average cost of construction. A large part of the money was spent on an extensive water supply arrangement, including a manhole and a long length of pipe-line made necessary by having to position the ponds some distance downstream from the intake to obtain the necessary head of water. A more elaborate intake than would normally be required was also provided here because of the flashy and torrential nature of the stream and the fine sand and gravel terrain through which the waters flow before reaching the intake. In spite of the precautions taken, however, the water supply was cut off on a number of occasions at times of flood when fine sand and silt from the bed of the river choked up the intake.

(*b*) ENNISCORTHY

This unit was constructed for £263 which is well below the estimated average construction cost. The existence of an old millrace which provided a ready-made intake from the river was the main factor in keeping down the cost.

(c) GENERAL

Any person wishing to undertake small scale fish farming should bear in mind that the cost of constructing a unit will depend on a number of factors, principally the feasibility of having excavation work done at a reasonable cost and the availability of an adequate and unfailing supply of running water. A five-foot head of water should be available for the ponds within the compass of the site so that they can be filled or drained dry, as required. The importance of being able to maintain a constant supply of water (one hundred gallons per minute for a five pond unit) must be stressed.

The estimated average construction cost of a fish farm unit is £300. A State grant of twenty-five per cent. of the cost, subject to a maximum of £80, is available to persons wishing to undertake small scale fish farming.

Equipment

(a) AHERLOW

The cost of equipment for this unit amounted to £105, made up as follows:—

Net	£7	10	0
Mincer, plates, etc.	£65	0	0
Motor and accessories	£32	10	0

A somewhat bigger and more costly mincer than would normally be required was obtained by this farmer as he intended to expand the scope of his operations at a later stage.

(b) ENNISCORTHY

The cost of equipment was as follows:—

Mincer	£5	0	0
Fitting of mincer to tractor ...	£5	0	0
Net	£9	5	0
Utensils, etc.	£15	0	0
TOTAL	£34	5	0

(excluding written down value of tractor)

The farmer used a hand mincer operated by direct drive from a tractor. Adapting the tractor for this purpose meant that it could not be used for any other type of work.

(c) GENERAL

It may be taken that any person wishing to use large quantities of fish offal will require a mincer and motor, the combined cost of which will be in the region of £85 to £90. He will require a net for removing the fish from the ponds. The average cost of such a net would be about £8 to £10. The total cost of equipment would therefore be roughly £100.

Stocking

Both units were stocked in the summer of 1960 after the farmers had completed a course in pond fish culture at the fish farm of the Inland Fisheries Trust at Fanure, Roscrea. At the end of May 11,000 fry and 2,000 fingerlings of Shasta rainbow trout were stocked at Aherlow and in the following month 15,000 fry were stocked at Enniscorthy. The quantity of fingerlings taken by the Aherlow farmer ensured that he would have an earlier income from the sales of finished fish but at a reduced margin of profit, due to the higher initial cost of fingerlings as compared with fry. Stocking with fingerlings also occupied more of the space available so that the full quota of 15,000 fish could not be stocked.

The cost of stocking in each case was as follows:—

Aherlow				*Enniscorthy*			
11,000 fry ...	£82	10	0	15,000 fry ...	£112	10	0
2,000 fingerlings ...	£50	0	0	Delivery charge (2 runs) ...	£10	0	0
Delivery charge (2 runs) ...	£10	0	0				
TOTAL	£142	10	0	TOTAL	£122	10	0

Rearing and feeding

(*a*) AHERLOW

The fry were fed initially with cirrhotic liver and later with food pellets and fish offal. The fingerlings were fed with food pellets and small quantities of liver from the beginning. A suitable mincer capable of dealing with fish offal did not arrive until May, 1961, so that the bulk of the food given consisted of pellets and cirrhotic liver and the cost of feeding was, therefore, much higher than would normally be the case. Since he acquired the new mincing equipment, the farmer has been able to feed the trout mainly on fish offal which he obtains cost free. Collections of offal are made in conjunction with deliveries of trout so that no extra expense is involved.

The quantities and cost of each type of food given are as follows:—

(1) Liver 1¾ tons—estimated value £105*
(2) Pellets 2¼ tons—estimated value £111*
(3) Fish offal 1¾ tons—obtained free of charge.

* Including quantities of liver and pellets having a combined value of £50, provided free of charge to Mr. Leonard by Clonmel Foods Ltd., Clonmel, Co. Tipperary (liver) and Blue Cross Ltd., Limerick (pellets).

(*b*) ENNISCORTHY

The fry at this unit were fed in the beginning with cirrhotic liver. During a period when liver was in short supply, quantities of meat and bone meal, fish meal and hard-boiled eggs were substituted and proved adequate temporarily. These

types of food given by the Enniscorthy farmer when liver was not available could not be recommended for feeding over a long period as they could be harmful. The farmer changed over almost completely to fish offal and small quantities of food pellets after six weeks, thereby reducing the cost of feeding considerably. He was able to secure offal free of charge, the only expense being the cost of transporting it to the farm.

The quantities and cost of liver, pellets and fish offal fed were as follows:—

(1) Liver	2½ cwt.	(valued at £7-6-0)
(2) Pellets	17 cwt.	(valued at £41-10-0)
(3) Fish Offal	10 tons	(cost of transport £50-0-0)

(c) General

It may be taken that the amount of fish offal available and the cost at which it can be obtained will have a big influence on the margin of profit that can be secured from any fish pond unit. If the fish are stocked as fry, it will be necessary to feed liver for some time, but a gradual change over to other foods can normally commence after a period of five or six weeks. It has been found that food pellets must be supplemented to some extent by another type of food and, where quantities of fish offal are available, it would be best to confine the use of pellets to, say, Sundays which will temporarily eliminate the need for mincing fish offal. In the use of fish offal the farmer is not restricted to white fish. Herring can be used, provided a vitamin B additive such as "Thiamin" is mixed in to the extent of two per cent. of the amount fed in summer and four per cent. in winter. Dog fish or any fish likely to give rise to a high ammonia concentration in the ponds should be avoided.

It should be noted that fasting of the fish is necessary before sale to ensure that undigested food in their stomachs does not taint the flesh. The fish in the pond containing those to be sold should not be fed for a period varying with the temperature, which governs the rate at which they feed and digest food; it will generally vary from two or three days in summer to six or seven days in winter.

Supervision

Both units were inspected monthly by a biologist of Fisheries Division. The fish were graded on six occasions. Apart from a slight outbreak of fin rot in some of the fish at Aherlow, which was quickly cured by means of Malachite Green and did not kill any fish, there was no instance of disease at either unit. A total of 217 dead fish were found at Aherlow and 170 at Enniscorthy, the bulk of these having failed to survive the after-effects of the journey from the supplying fish farm at Roscrea.

The technique of fish farming was quickly learned by each farmer and no difficulty was found in dealing with the fish.

Marketing

(*a*) AHERLOW

The first of the fish stocked as fingerlings in May, 1960, were ready for marketing in August, 1960, and weekly sales were made from 5th August until 20th October when that stock was cleared. The first of the fish taken as fry reached market size the following February and were sold from mid-February until all the stock was cleared at the end of September. The farmer was able to dispose of the fish at an average price of 4/6 per lb. They were sold to fish merchants in the main but quantities were sent to the Dublin fish market and also to catering establishments. Local sales also accounted for small quantities. The total income from sales of 2,791 lb. of fish amounted to £629 16s. 0d.

(*b*) ENNISCORTHY

The fish were ready for the market in March, 1961, and weekly sales were made from early March until the end of September when all the fish were cleared. Arrangements were made with a local hotel for delivery of weekly supplies and quantities were sold to a local fish merchant. Other quantities were sent to the Dublin fish market while local direct sales accounted for the remainder. The average price per lb. obtained was 3/3d. the income from sales of 3,200 lb. being £520 9s. 0d.

(*c*) GENERAL

The five pond unit is designed to produce roughly 1½ tons (3,360 lb.) of finished fish yearly. The experience of the farmers at Aherlow and Enniscorthy indicates that this quantity of fish could be disposed of by promoting sales to fish merchants and hotels within a reasonable radius. There is a good demand for trout from tourists in the summer season, while the shortage of fresh sea fish at times creates a demand for the produce of a fish pond unit. The somewhat limited experience of the farmers in connection with the Dublin fish market showed that, while a reasonable price was normally obtained, the cost of transport, etc. tends to make it uneconomic to send the fish to Dublin.

Losses of fish

(*a*) AHERLOW

The following figures indicate how the 13,000 fish were disposed of:—

Number stocked	13,000
Number sold	7,392
Known casualties	217
Balance lost from various causes	5,391

It is known that a number of fish escaped from the ponds as rainbow trout have been caught in the adjoining river. It is possible that a further cause of the depletion in stocks was the fact that the grading could, with advantage, have been commenced earlier and have been carried out more frequently.

(*b*) ENNISCORTHY

Number of fish stocked	15,000
Number sold	10,009
Known casualties	170
Balance lost from various causes	4,821

The fish at this unit were attacked by otters on one occasion before the farmer had time to take precautions against them and it must be presumed that large numbers were eaten. As in the case of the Aherlow unit, it is also possible that more frequent grading would have helped to stop the decline in stocks.

(c) GENERAL

While it is a normal occurrence for a fair proportion of fish stocked at a fish pond unit to disappear, it is fairly certain that this can be avoided if they are graded frequently to secure the segregation of fish of the same size into individual ponds, particularly within the months immediately after stocking. Rainbow trout are prone to cannibalism and this is generally more prevalent at the earlier stages of growth than later. Stronger fish not only monopolise the food but are inclined to eat the weaker ones or harry them to death.

A suitable grading routine would be one carried out at the commencement of each calendar month.

Financial outcome

(*a*) AHERLOW

Income from sales		£629 16 0
Expenses—		
Fry and fingerlings	£142 10 0	
Liver	£78 3 5	
Pellets	£87 13 0	
Fish offal (collected free of charge)	Nil	
Marketing	£44 14 10	
Total Expenses		£353 1 3
Profit		£276 14 9

(*b*) ENNISCORTHY

Income from sales	£520 9 0
Expenses—	

Fry	... £122 10 0	
Bone meal, fish meal, etc.	... £13 0 0	
Liver	... £7 6 0	
Pellets	... £41 10 0	
Marketing	... £30 0 0	
Transport of fish offal ...	... £50 0 0	
Petrol and disinfectants	... £23 10 0	
Total Expenses ...	...	£287 16 0
Profit		£232 13 0

(c) General

The principal factor in determining the margin of profit would appear to be the availability of adequate quantities of fish offal at low cost. It would be prudent to assume that the average price of 4/6d. per lb. obtained by the Aherlow farmer may be reduced with the expansion of rainbow trout production and it may not, therefore, be an economic proposition to feed liver and pellets to any great extent.

Labour

Production is planned so that the demand on the farmer's time is kept as low as possible consistent with getting a worthwhile return for his outlay. The labour involved would in no circumstances be full-time and this form of production is intended to provide a welcome additional source of income to the type of small holding on which existing farm work leaves a certain unused margin of the available labour. The time devoted to the care of the fish ponds would be roughly an hour every day and a few hours extra once a month and once a week at later stages as follows:—

Stage	Operations carried out by one person save where otherwise shown)	Hours per day	Man-hours per week	Total man-hours
I. (13 wks.)	Preparation of food	½	3½	7 x 13
	Feeding (twice daily)	½	3½	
II. (39 wks.)	Preparation of food and feeding..	1	7	8½ x 39
	Grading (2 men for 3 hours once a month)	3/14	1½	
III. (13 wks.)	Preparation of food and feeding ..	1	7	11 x 13
	Netting for transfer to starving pond (2 men for 1 hour per week)	2/7	2	
	Grading (automatic at this stage when netting as above) ..	—	—	
	Preparing for market (on average)	2/7	2	
	Total over 15 months ..	..	..	565½ man-hours

The above figures do not include time for securing supplies of food which are assumed to be either delivered at farm or collected in course of journeys which would be made for farm purposes generally. Neither is time included for marketing which would vary according to the method adopted. Stage I above relates to rearing from fry stage ; if ponds are stocked with fingerlings, only Stages II and III apply.

General observations

The units have demonstrated clearly that, where site conditions are suitable, small scale pond culture of fish can easily be fitted in with the operations of an ordinary farm. As was to be expected from a completely new venture, some difficulties were encountered but these have been overcome and future operators can undertake production with the assurance that no insuperable difficulty will normally be met. Technical advice and general information on practical problems are obtainable by prospective fish farmers from Fisheries Division, Department of Lands, 3 Cathal Brugha Street, Dublin 1.

Demonstration units are now located at the following centres throughout the country.

Aherlow, Co. Tipperary.

Blackwater, Enniscorthy, Co. Wexford.

Raford, Kiltulliagh, Loughrea, Co. Galway.

Ballymote, Co. Sligo.

Crookedwood, Mullingar, Co. Westmeath.

Any person wishing to take up this form of production should first visit one of these units and see for himself the conditions necessary for successful operation.

It will be noted that in the case of the units at Aherlow and Enniscorthy the fish were stocked in May and were not finally disposed of until September of the following year. It may be taken that the accounting period for a full operation takes roughly fifteen months but restocking with fry is carried out in the spring of each year from about the date on which the fry were first stocked. There is accordingly a regular annual return from sales, against which are charged the cost of restocking and the operating expenses.

DEPARTMENT OF LANDS,

(Fisheries Division).

JUNE, 1962.

APPENDIX No. 29

MEASUREMENTS AND GROWTH OF IRISH LOBSTERS

By

F. A. Gibson, Ph.D., Inspector

It has long been recognised that a close relationship exists between the overall length of a lobster and the length of the carapace, i.e. the rigid and smooth portion which encases the head region and gills, measured from the back of the eye to the commencement of the segmented part of the body (see Fig. 1). Appropriate measurements of a large number of lobsters of each sex, in connection with recent investigations into Irish lobsters have made it possible to describe mathematically the relationship between these two dimensions by reducing them to a regression equation in which $y = a + bx$, y being the overall length and x the carapace length. Thus it is possible to determine the total length of lobsters from the carapace length where the values of a and b have been established. The formula, obtained from a number of measurememts for male lobsters, is as follows:—

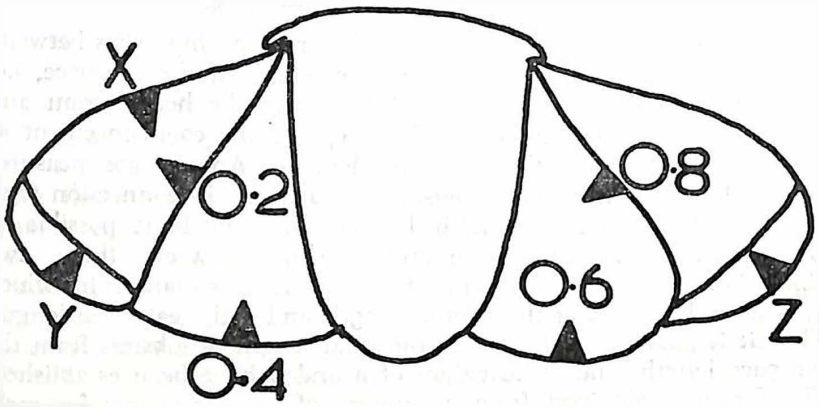
$y = 2.537\ x + 2.77$. In the case of a lobster having a carapace length of 7.5 cm, $x = 7.5$ and y the total length, is given by the following:—

$$\begin{aligned} y &= 2.537\ x + 2.77, \\ &= 2.537\ x\ 7.5 + 2.77, \\ &= 21.783 \text{ cm or } 8.57''. \end{aligned}$$

The chief practical advantage of measuring the carapace lies in the fact that it is always possible to do so with great accuracy and considerable speed; the only equipment required is a simple gauge or calipers.

The growth rate of lobsters is also of considerable importance. In many species of fish, it is comparatively easy to determine the length/age relationship. In the case of herring and salmon, for example, each scale bears a number of annual rings which permit an accurate estimate of the age to be obtained in relation to the length. Similarly in the case of escallops, the concentric rings on the shell are laid down in winter time and again length for age is readily calculated. For lobsters, however, there is no record left in any part of the animal which would help to determine annual growth. This is because lobsters increase in size by a process called *ecdysis* or moulting. At certain times of the year lobsters cast off their shells completely. From the old shell emerges a soft lobster. At first it is helpless, unable to move, but quickly it takes up water, swells to its *new size* and the shell starts to harden. The new hardened shell is larger than the shell from which the lobster emerged; it is also completely dissociated from that discarded shell and no mark or ring appears anywhere to indicate the difference in size between the new

and the old shell. In order to obtain an idea of the size increase made at each moult, marking experiments were undertaken. The procedure of marking involved punching a coded system of holes in the tail plates as illustrated in this diagram:—



From the results of these experiments it was found possible to devise codes for lobster carapace lengths ranging from 7.0 cm up to 12.0 cm. For example, punch marks at X and 0.8 indicate that at the time of marking the lobster had a carapace length of 7.8 cm. Again, if punched at Y and Z the carapace was 11.0 cm in length. When any such lobster moults the punch mark is retained on the new shell. Therefore, when a tail-punched and moulted lobster is recaptured its new carapace length can be measured and related to the carapace length at liberation by reference to the code of punch scars on the tail. In order to get some idea of the frequency of moulting, a different code is used for each year, thus making it possible not only to assess rates of growth but also to distinguish between the different years in which growth increments have occurred.

The relationship between the increase in length whilst the lobster was at liberty and the time of absence before recapture is given in Fig 2. There are three distinct groups of dots (each dot represents one moulted lobster). They occur roughly 2-3 months, 5-9 months and 12-18 months after liberation, and each group shows a gradual increase in size. The actual figures reveal that the smaller lobsters, i.e. those of from 7 to 10 inches, make a much larger increment of growth than the larger ones. The important feature of this diagram is in showing that, up to a size of at least 11 inches, lobsters increase in length approximately 6% per moult, or 18% in a year and a half. In terms of weight increase a 6% length increase can be from 10% to 20% or more, depending on size of lobster. Translated into actual figures, this means that an 8½" lobster in January can grow to approximately 10" by the summer of the year following and may have increased by as much as 70%-80% in weight in that time.

In addition to the foregoing information, the investigations into Irish lobsters have revealed many other interesting details of the life of this valuable shellfish and much of the data obtained will have a practical value as far as the measures for the future conservation of stocks are concerned.

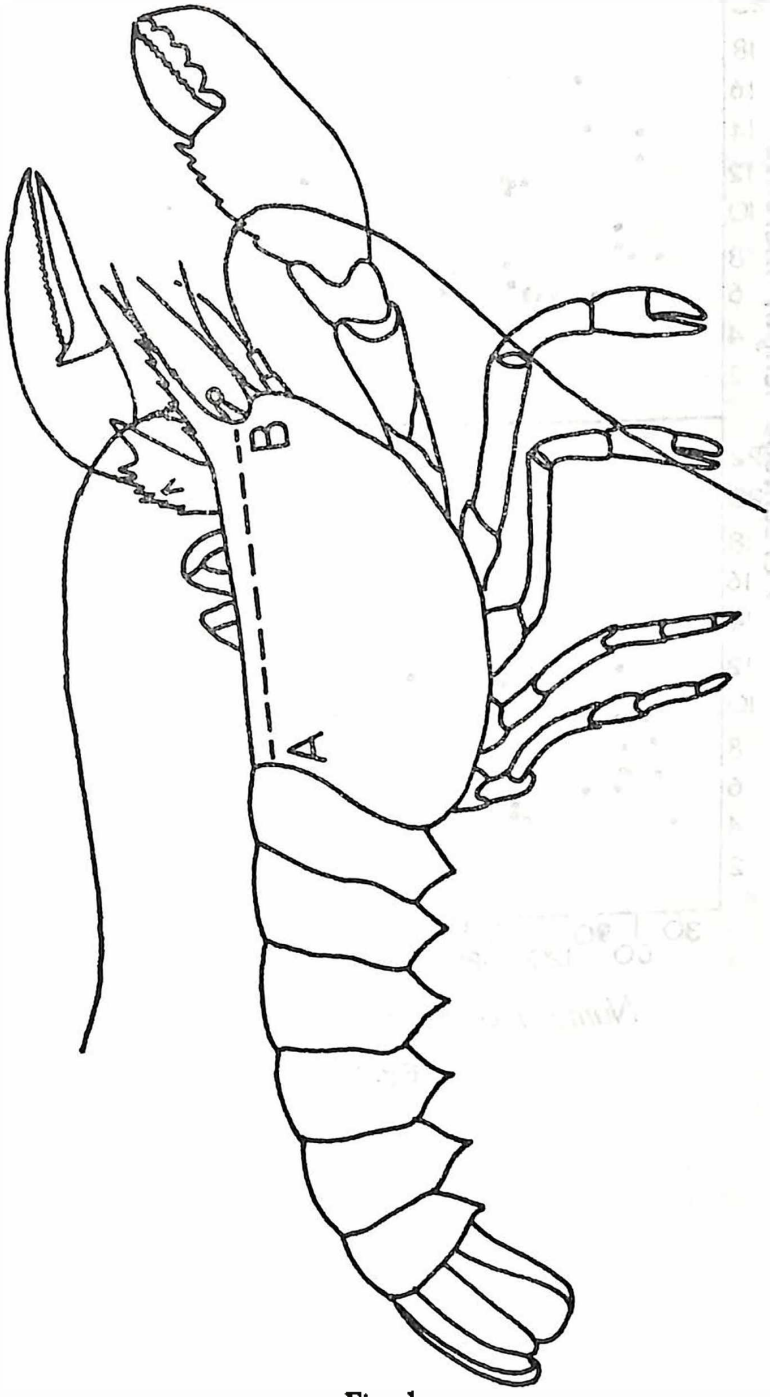


Fig. 1

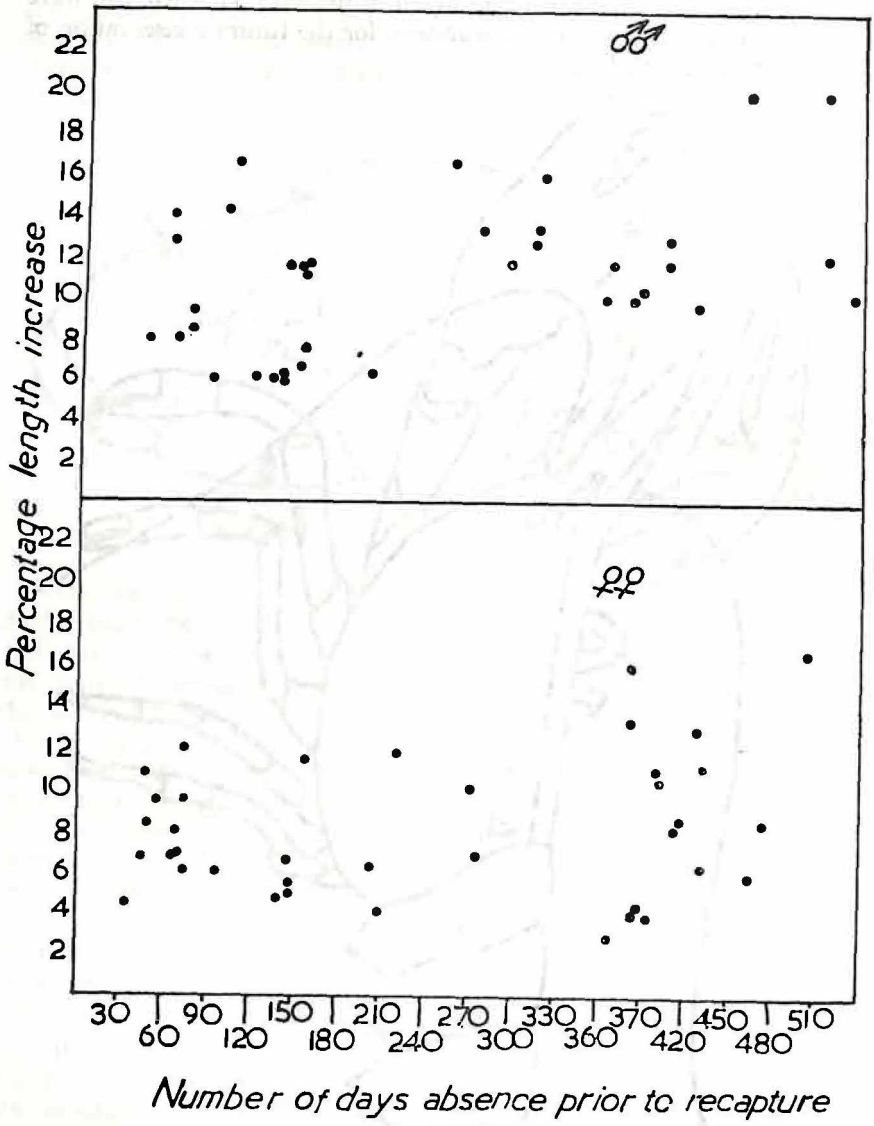

♂♂
♀♀
Percentage length increase
22
20
18
16
14
12
10
8
6
4
2
30 60 90 120 150 180 210 240 270 300 330 360 370 420 450 480 510
Number of days absence prior to recapture

Fig. 2

APPENDIX No. 30

NOTES ON OYSTER FISHERIES

By

J. P. Hillis. B.Sc., Assistant Inspector

1. Natural life cycle of the flat oyster

The oyster native to Ireland is the European flat oyster (*Ostrea edulis*). In summer, when the temperature rises above 16°C, female oysters containing fertilised eggs become progressively "Whitesick", then "Greysick" and finally "Blacksick", at which stage they release large numbers of larvae or tiny swimming young. These drift planktonically for 1 to 2 weeks before sinking to the sea bottom to settle and cement themselves to pieces of shell, stone, or other hard object. They remain there for the rest of their lives, though they become free of the cement when they grow sufficiently large. They require sheltered waters, usually thriving in quiet bays, slightly below low tide level. They grow to marketable size in about 5 years, and may live for 20 years or more reaching a diameter of 9 inches or over. They feed on small particles suspended in the water by drawing a current continually into the mantle (inside the shell) screening off and retaining particles of food.

2. Oyster cultivation

Natural oyster growth is slow and the stock in any one place is often small. Keeping oysters artifically on an intensive scale can be more profitable; it reduces the labour in collecting the oysters but calls for highly systematic operations.

3. Operations of oyster culture or farming

A. *Choice of suitable site*

The site must be low down on the shore in sheltered waters free from strong currents and of suitable salinity—at least 23 parts per thousand (higher for spat). For the fattening of adult oysters water depth is important and preferably they should be continuously submerged with the possible exception of low spring tides. For spat, it is essential to have shelter, protection from enemies and convenient handling; the sides of the entrance to a bay are often suitable for spat collection. The bottom of the site selected should be hard shale with embedded pebbles, etc., muddy sand (not *clean* sand which is found where wave action is stronger and may shift in storms) or mud which can be made suitable by addition of shells or shelly sand if it is too soft.

B. *Spat collection*

Spat will settle readily on "collectors" or hard surfaces provided by tiles or slates dipped in lime, moulded eggpacking "shapes"

dipped in cement wash, and shell (any type, but mussel is best) spread loosely to form a carpet for large-scale collection. Collectors should not be laid out very long before the spatting season which may be in July or possibly August as the date of the onset of spatting varies according to temperature and takes place when there is sustained rise above a level of about 16°C. (The Dutch practice of conducting running surveys of the plankton content of the water to ascertain when larvae are sufficiently numerous to warrant the laying out of tiles is recommended.)

C. *Scraping off collectors*

Where limed tiles or egg trays are used these may be collected and the oyster spat carefully removed to avoid breaking the soft shells where the cement or lime wash is hard. The spat may then be put either in beds surrounded by crab proof fences or into wire trays with lids, for 4-6 weeks until the shells harden. This is done in the early part of the year. Alternatively, the oysters may be left to grow for a longer period without removing them from the collectors until their shells harden, thus saving labour but at the risk of overcrowding, crooked growth and possibly higher mortality. Oysters collected on shell are not broken off but left until sorting, etc., in later life.

D. *Growth on beds*

Oysters are removed from collectors at the earliest in their first February (at c. 6 months old) and are marketed 4 to 5 years later. In both France and Holland they are taken up, examined and cleaned of weed, dead shell (including that on which they may have settled originally), enemies, e.g. starfish, crabs, dog whelks, etc., at least once, usually at about 2½ to 3 years old, and relaid, usually on deeper beds, where danger from enemies is less likely and where they may fatten more quickly. Beds for different purposes are normally marked with tall stakes and, if necessary, a fence of closely placed stakes protects the oysters against wave action and restricts the entry of certain species of ray which prey on small or medium-sized oysters. Handling of oysters during the warmest months of the year should be avoided.

E. *Marketing*

The season during which flat oysters are usually eaten is September to April, inclusive. The following factors are important:—

(i) Sanitary control and purification,

(ii) Grading, which determines prices, and

(iii) Adequacy of arrangements for suitable packaging of consignments for market. Tight packing is necessary to prevent oysters from opening on the journey. Air transport, where freight compartments are not pressurised, may have disadvantages ; watertight containers should be used.

4. Application of principles to Irish localities

A. *Limited natural breeding*

Spatfall in the case of flat oysters occurs in appreciable quantities only in very warm summers. A greater production and settlement of spat can, however, be expected on a bed on which oysters, either native or imported, have been densely laid.

B. *Legal position*

Legally, Irish oyster beds fall into two classes—public (upon which any member of the public may fish) and private. In order to preserve stock on which money or labour is to be expended, it is usual to seek a private bed. The usual method of acquiring a private bed is by licence or order entailing the holding of a public inquiry at which any objections are heard. Having considered a report of the inquiry the Minister for Lands may grant a licence or make an appropriate order. In addition, where no such prior right exists, a lease of the requisite area of foreshore for oyster cultivation, must be obtained from the Minister of Transport and Power.

C. *Importations*

Since oysters from certain countries would be liable to possible infestation by the Slipper limpet (*Crepidula fornicata*), the American Oyster Drill (*Urosalpinx cinerea*) and other pests, the import of brood stock is strictly controlled. Supplies mainly come from Brittany where prices vary according to the time of year, size of oysters required and whether the current spatting season has been good or bad.

D. *Equipment*

Since the equipment required depends on the method of cultivation to be employed, the most satisfactory way to keep overheads down is probably to use shell for laying provided that sufficient quantities are readily available. Tiles are heavy and require more handling. Apart from shell, basic requirements are a small boat for transport, a dredge, barrels or boxes for packing oysters, a supply of light timber for marking stakes, a shed with a bench for examination and sorting, and various wire baskets or string bags, shovels, etc. It may be possible in some cases to dispense with a boat, but this would probably entail laborious spells of work during low spring tides to get a great deal done in a very short time by way of transporting sacks of shell, oysters, etc., and it is not to be recommended. The shed used for dealing with oysters must be kept extremely clean.

E. *Suggested methods of cultivation*

The most practicable course of action would appear to be to start with 2 or 3 year old oysters laying them on a muddy bottom, augmented with shell, roughly at the low spring tide mark. Simultaneously, or later, one could obtain spat for rearing to full maturity.

It would probably be desirable, while starting with 2 to 3 year olds as the principal stock, to reduce costs gradually by concentrating in greater degree on the collection of spat. Shell or other collectors should be readily at hand to take advantage of any spatfall that may occur during a warm summer. Younger oysters should be kept higher on the shore than old ones, say, between low neap and low spring tide marks. It would be most important to observe progress frequently and be in a position to take immediate action to remedy any damage caused by either storms or enemies.

F. *Channels of marketing*

Apart from the home market, Great Britain, France, and other Western European countries offer good prospects for market exploitation provided that the exporter has full regard to packaging and transport requirements. Moreover the onus is on the exporter to have certified that the oysters despatched by him are suitable for immediate human consumption and are not contaminated in any way.

G. *Technical assistance*

Advice is available from the Fisheries Division, Department of Lands, to all who may be interested in the development of oyster fisheries.

5. Portuguese Oysters (*Crassostrea angulata*)

As an alternative to flat oysters, these offer the advantages of greater resistance to damage in handling and also to mud, silt and lowered salinity (e.g. due to influx of fresh water) when ponded. Furthermore, their growth rate tends to be better than that of the flat oyster. They would probably be suitable for experiments in areas not completely suitable for flat oyster culture. Disadvantages are that they are unlikely to breed in Ireland due to lack of the required high temperatures and they usually command lower prices.

Recommended Sources of Information

(*a*) Purification

Cole, H. A., (1954), *Purification of Oysters in Simple Pits*, Fisheries Investigations, Series II, Vol. XVIII, No. 5.

Ministry of Agriculture, Fisheries and Food (1961). *The purification of oysters in installations using ultra-violet light.* Laboratory leaflet No. 27. Fisheries Laboratory, Burnham-on-Crouch, England.

Wood, P. C., (1961), *The principles of water sterilisation by ultra-violet light, and their application in the purification of oysters.* Fisheries Investigations, Series II, Vol. XXIII, No. 6.

(*b*) General

Cole, H. A., (1956), *Oyster Cultivation in Britain.* London, H.M. Stationery Office, 5s. 0d.

Orton, J. H., (1937), *Oyster Biology and Oyster Culture.* London, Collins, 21s. 0d.

Yonge, C. M., (1960), *Oysters* (New Naturalist Special Volume). London, Collins, 21s. 0d.

APPENDIX No. 31

INVESTIGATIONS INTO STOCKS OF DUBLIN BAY PRAWNS (*NEPHROPS NORVEGICUS*) IN IRISH WATERS, 1958-61

By

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The stocks of *Nephrops* in the Irish Sea have been comprehensively sampled during the past four years. Samples have been examined from the Dublin market, from commercial fishing vessels and from the *Cú Feasa* during this period. In 1961, investigations were extended to include samples from Killybegs, Galway Bay and the bays of the south-west coast of Co. Cork.

Only the Irish Sea stocks are at present exploited to any great extent by Irish vessels. Most of the fishing there takes place on grounds of 15 to 30 fathoms in depth from Lambay Island to Clogherhead and some twenty-five to thirty 50-60 foot boats using courlene vinge trawls, usually of 50 to 45 mm mesh, are engaged. The landing places are Clogherhead, Balbriggan, Skerries, Howth and Dublin.

Irish Sea landings of *Nephrops* each year from 1958 to 1961 were 11,206, 14,436, 7,720 and 14,072 cwt., respectively. The drop in landings in 1960 was probably due to late recruitment of young *Nephrops* to the stocks after the main fishing had ceased in that year.

The mean percentage monthly landings over the ten years 1951-1960 were as follows:—

Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
0.7	2.3	3.1	9.6	10.4	19.7	22.4	19.6	8.0	2.9	0.7	0.6

Thus, this species is most actively fished from April to September. In the earlier part of that decade, the peak landings occurred late in the season, i.e., in August and September, but in 1959 and 1960 peak landings were in April. In 1961, however, peak landings occurred in June, but these were only fractionally higher than the April and May landings of that year. There has been, therefore, a reversal in the pattern over the past ten years.

In September, a considerable proportion of the females is ovigerous, i.e. in berry or carrying their eggs. These eggs are greenish black at this period, being newly deposited. The proportion of females, berried or otherwise, in the catch declines rapidly as winter advances. By April the eggs have developed a pinkish colour and are at the "eyed" stage, i.e. ready to be hatched and cast off. This occurs during the latter half of April and early May and the planktonic stages of the newly hatched larval *Nephrops* swim in the upper layers of the sea for about three weeks, after which they take to the sea bottom and there undergo rapid moults with fast increasing growth rate. When they reach the adult stage, moulting as a rule

occurs most frequently during the periods April-May and August-September. The proportion of females in the catch increases during the late April to early September period, often reaching a maximum of over 50% during June and July. In the winter months, the proportion of females present is low, reaching a minimum in the January and February period. Females have a considerably lower mean average length; consequently, the great reduction in the number of females present during the winter months could be the reason why there is a tendency for the mean length of the winter samples to rise somewhat.

In measuring the lengths of individual *Nephrops*, it is now customary to measure the carapace length rather than the total length. However, both lengths are used in this report for convenience. The smallest individuals examined had a carapace length of 1.22 cm (3.9 cm total length). The largest male encountered measured 5.9 cm in carapace length (18.7 cm total length), while the largest female measured 5.2 cm in carapace length (16.5 cm total length). Generally, it is found that males do not exceed 18 cm and females 13 cm total length in these waters.

In recent years there has been a growing commercial demand for *Nephrops* the tails (marketable portion) of which are generally more than two inches long. This corresponds to a carapace length of 2.7 cm (8.8 cm total length). Individuals with a carapace length of not less than 3.4 cm (11.0 cm total length) are considered to be of prime quality. This figure can be used as a convenient yardstick to evaluate the "market quality" of samples of *Nephrops*.

The results of sampling during the past four years are given in Table 1.

Table 1

(i) IRISH SEA

Year	Period	Type of sampling	Mean length of all *Nephrops* sampled		Percentage of *Nephrops* of carapace length of	
			Carapace	Total	2.7 cm. and over	3.4 cm. and over
1958	May–November	Market	3.00 cm.	9.8 cm. (3.86 in.)	70.7	23.8
1959	January–October	do.	3.08 cm.	10.0 cm. (3.94 in.)	65.7	25.9
1960	April–September ..	Research Vessel and Trawlers	2.96 cm.	9.7 cm. (3.82 cm.)	67.7	23.5
1961	January–December ..	do. do.	2.82 cm.	9.2 cm. (3.62 in.)	58.9	18.0

TABLE 1

(ii) OTHER IRISH WATERS

Ground	Period	Sampling	Carapace length (cms.)		Total length (equivalent of mean in)		Percentage of Nephrops with Carapace length of 3.4 cm. or over	
			Variation	Mean	cms.	ins.	Variation	Mean
Killybegs ..	August 1961	Trawlers ..	3.70—4.23	3.86	12.4	4.88	62.7—86.8	70.2
Galway Bay ..	September ,,	Research Vessel	3.10—3.35	3.17	10.2	4.02	28.9—56.0	31.8
Baltimore Bay ..	October ,,	do. ..	3.19—3.39	3.26	10.6	4.17	35.4—45.8	40.2
Dunmanus Bay ..	October ,,	do. ..	3.40—3.64	3.53	11.4	4.49	54.2—78.5	65.5
Kenmare River ..	October ,,	do. ..	2.57—3.37	2.74	9.0	3.54	6.6—56.2	13.1
Bantry Bay ..	October ,,	do. ..	2.63—3.27	2.93	9.6	3.78	11.3—46.0	24.7

From Table I (i), it can be seen that the average size of the Irish Sea stocks has decreased since 1959. The drop in mean length would not appear to be serious, but the percentage of larger individuals in the catch has dropped considerably, with the result that the bulk of the catch has had to be regarded as "smalls". This has the unfortunate aspect that during the summer months females form a large proportion of the catch, thus lessening the number available to spawn in September.

In other areas samples (see Table I (ii)) the average size was considerably higher than that recorded for the Irish Sea, but the rate of catch per hour experienced was so low that fishing solely for *Nephrops* may be a dubious economic propostion, though it must be remembered that this sampling took place late in the year.

The monthly length distribution variations of Irish Sea *Nephrops* are given in Table 2.

TABLE 2

MONTHLY LENGTH DISTRIBUTION OF IRISH SEA *NEPHROPS* IN 1961

Carapace cm. length Group	January			February			March			April			May			June		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
1.5—1.9	–	–	–	2.0	0.9	2.9	2.2	2.3	4.5	2.3	2.6	4.9	0.5	1.4	1.9	..	0.1	0.1
2.0—2.4	5.2	1.3	6.5	13.4	5.0	18.4	14.1	10.9	25.0	11.7	14.6	26.3	4.0	3.3	7.3	5.7	10.1	15.8
2.5—2.9	21.9	1.0	22.9	29.8	2.0	31.8	27.6	2.6	30.2	22.4	6.6	29.0	16.6	2.8	19.4	17.3	28.6	45.9
3.0—3.4	33.6	–	33.6	27.7	–	27.7	24.7	0.2	24.9	22.0	0.3	22.3	24.2	0.9	25.1	16.6	11.8	28.4
3.5—3.9	29.1	–	29.1	16.0	–	16.0	12.0	–	12.0	15.2	–	15.2	32.5	–	32.5	7.3	1.4	8.7
4.0—4.4	7.2	–	7.2	2.7	–	2.7	3.0	–	0.3	2.3	–	2.3	11.7	–	11.7	0.9	0.2	1.1
4.5—4.9	0.7	–	0·7	0.5	–	0.5	0.3	–	0.3	–	–	–	2.1	–	12-1	–	–	–
5.0 & over	–	–	–	–	–	–	0.1	–	0.1	–	–	–	–	–	–	–	–	–
Total ..	97.7	2.3	100.0	92.1	7.9	100.0	84.0	16.0	100.0	75.9	24.1	100.0	91.6	8.4	100.0	47.8	52.2	100.0
	July			August			September			October			November			December		
1.5—1.9	–	0.8	0.8	0.7	1.2	1.9	–	–	–	2.9	2.8	5.7	1.9	3.5	5.4	1.4	2.9	4.3
2.0—2.4	5.9	10.2	16.1	7.8	10.6	18.4	–	–	–	22.2	10.2	32.4	18.6	14.6	33.2	12.2	11.2	23.4
2.5—2.9	12.5	31.0	43.5	16.3	22.9	39.2	–	–	–	28.2	4.8	33.0	26.9	1.9	28.8	32.6	4.0	36.6
3.0—3.4	20.4	17.2	37.6	18.5	11.5	30.0	–	–	–	21.1	0.5	21.6	19.4	0.9	20.3	19.3	0.3	19.6
3.5—3.9	1.0	1.0	2.0	6.8	2.6	9.4	–	–	–	5.5	–	5.5	9.2	–	9.2	11.0	0.1	11.1
4.0—4.4	–	–	–	0.9	–	0.9	–	–	–	1.2	–	1.2	2.3	–	2.3	4.0	–	4.0
4.5—4.9	–	–	–	0.2	–	0.2	–	–	–	0.5	–	0.5	0.6	–	0.6	1.0	–	1.0
5.0 & over	–	–	–	–	–	–	–	–	–	0.1	–	0.1	0.2	–	0.2	–	–	–
Total ..	39.8	60.2	100.0	51.2	48.8	100.0	–	–	–	81.7	18.3	100.0	79.1	20.9	100.0	81.5	18.5	100.0

During the summer months of 1960, mesh experiments were carried out by the *Cú Feasa*. Cod ends of various mesh sizes were employed. The results of several cruises are as follows:—

Cod End	*Mean carapace length*	*Mean total length*
70 mm	3.25 cm	10.5 cm (4.14 in)
65 mm	3.10 cm	10.1 cm (3.98 in)
60 mm	3.10 cm	10.1 cm (3.98 in)
50 mm	3.00 cm	9.8 cm (3.86 in)

These figures show that, as might be expected, the mean length of the individual decreases with a decrease in mesh size. Furthermore, 33.0% of the catch, using a 70 cm cod end was not less than 3.4 cm mean carapace length, whereas only 17.9% of the catch, using a 50 mm cod end was of this size. However, the percentages of the individuals with tails of two inches, or more, were 69% and 61%, respectively.

As a rough guide, the tail weight is one-third of the total weight. However, it was found that the cephalothorax and appendages (body) increase in weight more rapidly than the abdomen (tail). Whereas in very small individuals the tail weight is equivalent to 40% of the total, the largest have a tailweight equal to only 25% of the total. A formula has been devised to give an approximation of the percentage tailweight for a given carapace length as follows:—

$$P = 45.85 - 3.667\ Lc$$

where P = Percentage tailweight

Lc = Carapace length in centimetres

This formula has been derived from "dry" material, i.e. *Nephrops* which have been 1 day boxed.

The Irish Sea *Nephrops* grounds extend from the latitude of the South Rock L.V. to the latitude of Howth Head, and extend from the ten fathom line (approx.) off the coast to near the Isle of Man, and thence to a point 30 miles east of Clogherhead. The bottom consists mainly of mud, fine muddy sand or ooze.

No catch effort statistics for the commercial fleet are available for *Nephrops* fishing. Records of the rate of catch by the *Cú Feasa* have, however, been kept, and these show that over most of this area the catch per unit effort over the grounds fished was low, but off Rockabill and Clogherhead it was quite high (see Fig. 1). Further information was made available by Simpson working on the British research vessel *Sir Launcelot*. He indicated that there were heavier concentrations of Nephrops in certain areas.

The southwest Cork *Nephrops* grounds are shown in Fig. 2. The mean carapace lengths of the individuals from each ground are shown. Generally, the mean catch was 3/5 baskets per hour except

in Baltimore Bay where a mean of 1½ baskets were taken. These experiments were carried out in mid-October and presumably better catches would be forthcoming during summer months.

Diurnal and Nocturnal Variation: An attempt was made to determine diurnal and nocturnal variations of catch/effort of *Nephrops*. Fishing was confined to the Clogherhead grounds and a 72-hour cruise from 12th to 15th September, 1960, was organised but this was cut short slightly by unfavourable weather. The results, in brief, were that maximum catches of *Nephrops* occur about sunrise and about an hour before sunset. About two hours before sunrise the catch rapidly increases. In the forenoon the catch decreases somewhat but remains fairly high throughout the day. It rises to a high level again, approximately 2½ hours before sunset. By sunset the catch, already decreasing, falls off rapidly, and approximately 2½ hours after sunset it is at a very low level, and remains so until just before sunrise. Experiments carried out on board the *Sir Launcelot* in the Irish Sea from 2 to 4 September, 1960, showed similar results (Simpson). It is, therefore, quite clear that best results are obtained around sunrise and sunset.

References

Simpson, A.C., 1961. "Diurnal Variation in the Catches of *Nephrops norvegicus*".

I.C.E.S. Shellfish Committee No. 102. CM 1961.

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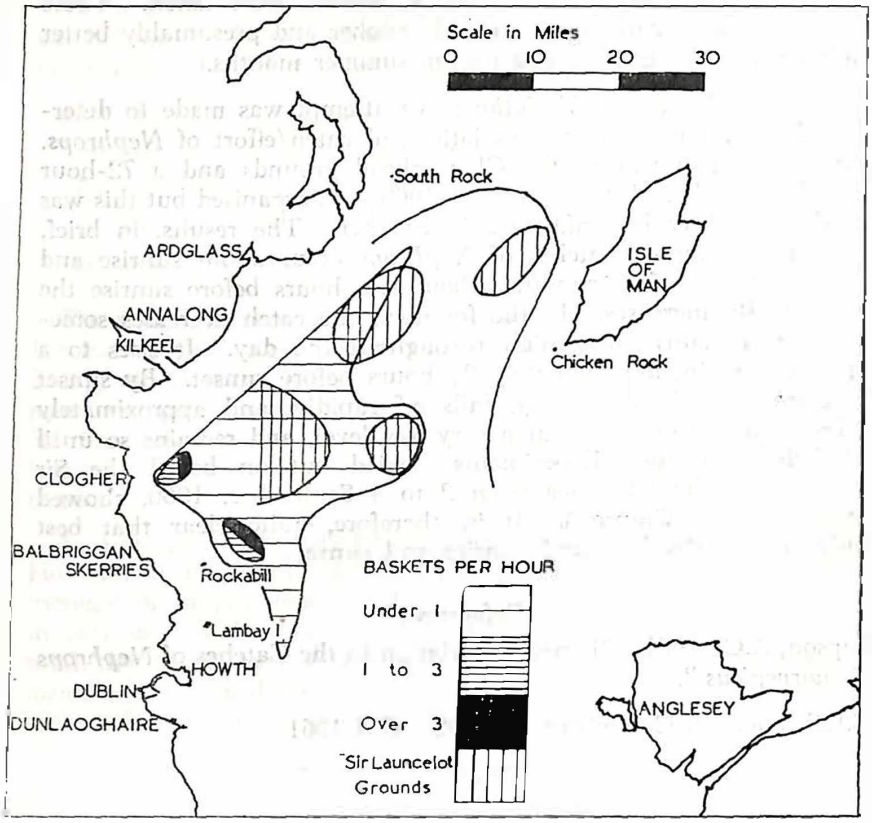
Scale in Miles
0 10 20 30
South Rock
ARDGLASS
ANNALONG
KILKEEL
ISLE OF MAN
Chicken Rock
CLOGHER
BALBRIGGAN
SKERRIES
Rockabill
Lambay I.
HOWTH
DUBLIN
DUNLAOGHAIRE
BASKETS PER HOUR
Under 1
1 to 3
Over 3
Sir Launcelot Grounds
ANGLESEY

Fig. 1

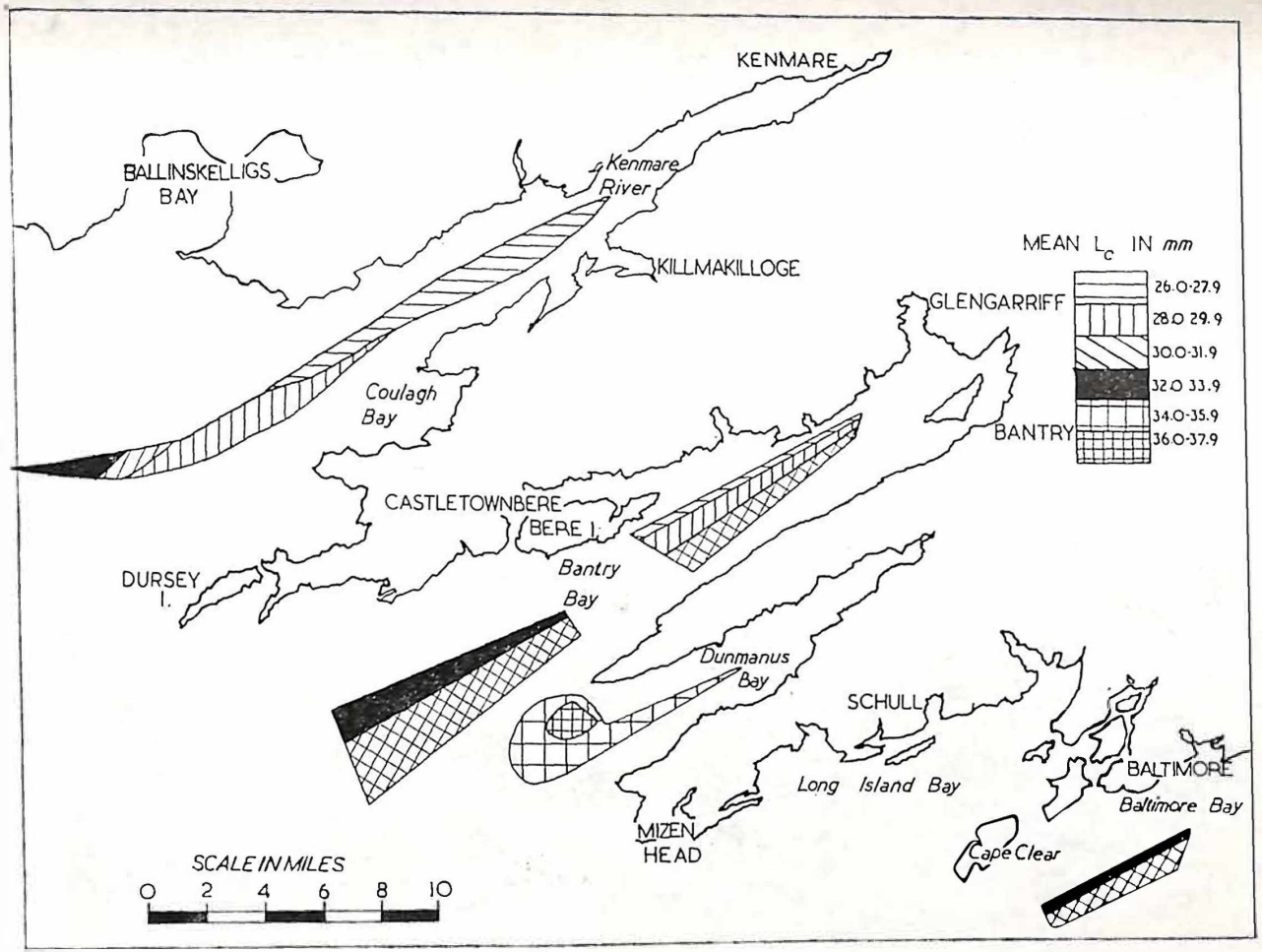
KENMARE
BALLINSKELLIGS BAY
Kenmare River
KILLMAKILLOGE
GLENGARRIFF
Coulagh Bay
BANTRY
CASTLETOWNBERE
BERE I.
DURSEY I.
Bantry Bay
Dunmanus Bay
SCHULL
BALTIMORE
Long Island Bay
Baltimore Bay
MIZEN HEAD
Cape Clear
MEAN L_c IN mm
26.0-27.9
28.0 29.9
30.0-31.9
32.0 33.9
34.0-35.9
36.0-37.9
SCALE IN MILES
0 2 4 6 8 10

Fig. 2